THE STATE OF THE ENVIRONMENT – 1990

CHILDREN AND THE ENVIRONMENT

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United Nations Environment Programme

United Nations Children's Fund

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Foreword

The decade of most children

During the 1990s, a larger number of children will be born on Earth than in any decade before – or later. As education spreads and living standards improve, human fertility is declining in most of the world's countries. The swelling numbers of children and youth already born will have families of their own, but their increase is projected to cease to balance declining fertility at about the end of this decade. World population will be growing, at slower and slower rates, and barring catastrophe, never again will such a high percentage of that population be children.

What do we owe those children – our children and our grandchildren? We owe them a planet fit to live on and capable of sustaining the future. Over the last generation, we have just begun to realize the magnitude of the threats to the global environment. We have just begun to realize how interrelated the planet is – how the destruction of forest and the burning of coal and oil affect climate and human welfare across countries and across generations.

This coming decade cannot be spent in business as usual. The ending of the cold war provides a unique opportunity for the great powers to confront the real threats to planetary survival. The past decade of debt and economic crisis has forced short-term economic adjustments – often at the expense of sustainable development for the longer term. The rapid political changes in the world require more fundamental economic changes to set in motion a more sustainable pattern of development over the next century.

The needs of children challenge our powers of foresight and planning for this future. Will we invest in them – in their health, their education, their environment, their economy? Or will we muddle along, pretending that past practice is the best guide to a world on the cusp of its population curve?

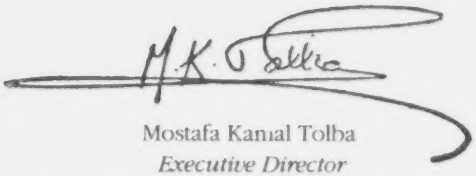
We, the adults of 1990, have both opportunity and responsibility. We have an unprecedented chance, given the knowledge, technology and resources, to make wise decisions and wise investments of our energy for those children of the 1990s. If we fail, the world and our children will be the poorer, and some will be caught in disaster. If we have the courage and vision to succeed, we may be remembered as the generation which pioneered a new way forward.

If we succeed for our children, moreover, a virtuous circle of reinforcing benefits can follow. Recent history shows that once child death rates are reduced to the extent that families become convinced that the children they do have will survive, birth rates – and population growth rates – will be lowered. This, with other actions in health,

education and family planning, can bring forward significantly the time when world population will level off and thus ease also the long-run pressures on the environment.

This report, issued as a joint contribution by UNEP and UNICEF, summarizes how children have been affected by environmental changes, and vice versa – and what can be done. Time is running out – but it is not yet too late.

UNEP and UNICEF are committed in their own spheres and together to help mobilize the action required.



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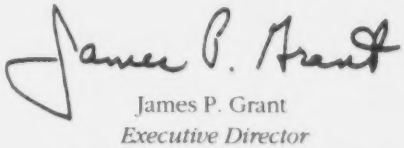

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Chapter I:

The environment, children and future generations

1. Introduction

Environmental degradation is killing children. It kills the poorest of the poor, children in developing countries already on the edge of existence. It strikes countries with already fragile farm sectors – stripping the soil needed for planting, hurting food production, and spawning malnutrition among the young. It kills infants and youth alike – poisoning the water they need for drinking, washing and irrigation, tainting the slums which are their playgrounds, spoiling the food they eat.

Air pollution strikes the young more harshly than the old – fueling the respiratory infections which kill more than 4.2 million children under age five each year in developing countries.

Toxic chemicals, heavy metals, radiation and poisons harm children both rich and poor more severely than adults, causing untold deaths yearly through cancers, birth defects and still-births in industrialized and developing nations.

And all the world's children will suffer from atmospheric pollution as we puncture the Earth's ozone layer, change our planet's environment – and leave a legacy of suffering and hardship for the young and those yet unborn.

There are clear moral reasons why efforts to end environmental degradation must focus on children. As this report will show, children are too often the victims of pollution – their young bodies make them far more vulnerable than adults to the poisons we spew into the air, and toxins we sow on Earth.

Moreover, the problem of environmental degradation is essentially a problem for children – not adults. They, and those still unborn – will inherit the Earth we leave them. Their futures are in our hands – only we can protect it for them.

But there is a practical reason why efforts to aid children must underlie all plans to aid the planet. The problem of environmental degradation is vastly complicated by the problem of over-population, of man's numbers far outstripping Earth's capacity to support its human caretakers. Reductions in birth rates must be a part of any efforts to save the Earth. And in that regard, one thing is clear: *Efforts to lower births, however well planned, cannot fully succeed unless they are accompanied by basic programmes to protect child health and ensure child survival.* Projects undertaken by UNICEF and other organizations have proved time and time again that parents will only choose to have fewer children when they know their children will live. As former Tanzanian President Julius Nyerere has said: "The most powerful contraceptive is the knowledge that your children will survive".

Some 14 million children under the age of five die every year in developing nations as a result of tainted drinking water, poor sanitation, environmental pollution, common diseases and malnutrition. A further three million are seriously disabled. Some 10 million of these deaths can now be prevented at low cost (by breast-feeding, oral rehydration therapy [ORT], proper food preservation and immunization), and, in effect, by better management of the environment. Thus, this tremendous annual carnage is due more to the failure to achieve such management, rather than to the nature of the human environment itself.

Sustaining development

A relatively new way of looking at the link between ecology and economic growth has emerged over the past few years – the concept of "environmentally sound and sustainable development". Plans governed by this concept always ask the question: "Will a given action help meet the present generation's needs, without jeopardizing future generations' prospects for survival?" A new concern becomes paramount: our generation's responsibility to protect the Earth we bequeath our children. This will be a major theme of this report.

The concept of sustainability brings children to the forefront of environment/development considerations, for children alive today are the first representatives of future humankind. If this generation cannot meet its own children's needs – not least the need for a healthy, nurturing environment – then there is little chance of our taking action to meet the needs of generations yet to come. The ability of governments to provide for children offers a test, a benchmark of their willingness to strive for environmentally sound and sustainable development.

It is a test all are failing: The 14 million annual child deaths mock much of the rhetoric of sound, people-focused development.

But elevating children's concerns does more than provide a new benchmark for development. It humanizes environmental questions in a way ordinary people can understand. Descriptions of how trace gases in parts per million may warm the Earth's atmosphere may seem too esoteric and technical for most people to grasp. But describing climate change and ozone depletion in terms of a less predictable, more dangerous and less healthy world for children and grandchildren makes threats real in a way scientific jargon cannot.

CHANGING HABITS – A CHILD'S VIEW

Since he existed, man has constantly tried to change his environment – man sows, man reaps, man builds, man destroys. Green landscapes are rapidly changing into grey, concrete ones. The natural world around us is falling into a state of disrepair – and all because we *Homo sapiens* are selfish and reluctant to change bad habits.

Peter Sandbach, Cheshire, United Kingdom, from *Children Think Green* (1988). UNEP, Nairobi.

2. Being fair to the future – and to the present

The concept of environmentally sound and sustainable development is an old idea coined in a new phrase. It restates the ancient goal of living off 'environmental interest', without dipping into capital.

In 1980, the International Union for Conservation of Nature and Natural Resources (IUCN), UNEP and the World Wide Fund for Nature (WWF) published *World Conservation Strategy*, the first systematic attempt to make sustainability paramount among environmental concerns. That report began by defining 'conservation' as "the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations" (IUCN, UNEP, WWF, 1980).

It was the publication in 1987 of the UNEP report, *Environmental Perspective to the Year 2000 and Beyond*, and the final report of the World Commission on Environment and Development (WCED), *Our Common Future*, which made environmental sustainability the new benchmark for all environment/development activities. The two texts firmly and forever united environmental and developmental concerns. They herald a new thinking which insists that the welfare of future generations – including those who exist on Earth today as children – be made an explicit, rather than implicit, consideration in all developmental planning.

Intergenerational equity

The concept raises concern for a new type of fairness and equality rarely considered previously – 'intergenerational equity'. This must now take its place among concerns for equality among races, sexes and nations. Achieving the latter forms of equity has proved difficult enough, even though the participants in the struggle have been present and able to fight for their rights. Equity among generations is a more difficult goal, in that unborn generations are not with us to make their concerns known. We living now must represent our descendants' interests for them. Achieving this goal may be the foremost challenge facing policy makers in the closing years of the 20th century, and beyond.

Few institutions are concerned with intergenerational equity. In the past, we assumed that our descendants would take their place on a planet very similar to the one we inhabit, perhaps with new technology to make life safer, healthier and easier. This is no longer a justifiable assumption. The present generation is the first to radically alter planetary ecosystems, and bequeath its offspring a planet very different from the one our own forebears left us. How radically we change the globe is up to us.

Although new as an environmental concept, concern for future generations was one of the central principles on which the UN was founded. The United Nations Charter of 1945 begins: "We the peoples of the United Nations, determined to save succeeding generations from the scourge of war...".

The preamble to the Stockholm Declaration on the Human Environment (1972) also expresses a concern for posterity: "To defend and improve the environment for present and future generations has become an imperative goal of mankind – a goal to be pursued together with, and in harmony with, the established and fundamental goals of peace and of world-wide economic and social development".

Three treaties negotiated about that time encapsulate this rising concern for the Earth we leave our children: the 1972 London Ocean Dumping Convention, the 1972 Convention Concerning the Protection of the World's Cultural and Natural Heritage and

the 1973 Convention on International Trade in Endangered Species. The subsequent regional seas conventions of UNEP carry forward this concern with future generations (Weiss, 1989).

United Nations Secretary-General Javier Pérez de Cuéllar brought together concerns both for children and future generations in discussing the Convention on the Rights of the Child, adopted by the United Nations General Assembly in late 1989:

> "The way a society treats its children reflects not only its qualities of compassion and protective caring but also its sense of justice, its commitment to the future and its urge to enhance the human condition for coming generations. This is as indisputably true of the community of nations as it is of nations individually" (Pérez de Cuéllar, 1987).

The concept of intergenerational equity poses major challenges, particularly in law economics. A study of international law and intergenerational equity sponsored and published by the United Nations University proposes three basic principles:

> – each generation must conserve the diversity of the natural and cultural resource base, so that it does not unduly restrict future generations' options. Each generation is entitled to diversity comparable to past generations;
>
> – each generation must maintain the quality of the planet so that it is passed on in no worse condition than it was received. Each is entitled to inherit an Earth comparable to the Earth which sustained its forebears;
>
> – each generation should provide its members with equal rights of access to the legacy from past generations (Weiss, 1989).

Thus justice among generations involves both duties and rights, both between generations and members of the same generation, as the third principle makes clear. How to accomplish this daunting task? The 1987 WCED report suggests "the designation of a national council or public representative, or an 'ombudsman', to represent the interests and the rights of present and future generations and act as an environmental watchdog, alerting governments and citizens to any emerging threats".

Some countries have already amended their basic laws or constitutions to recognize these issues. Others are considering the adoption of special national laws or charters setting out the rights and responsibilities of citizens and the State regarding environmental protection and sustainable development.

The Convention on the Rights of the Child has taken a somewhat similar approach in establishing a Committee on the Rights of the Child, to which States that have ratified the Convention must report on their progress in implementing the treaty. The Convention does not have any explicit provisions on children's rights relating to the environment. However, a number of its provisions cannot be implemented without paying attention to the environment as an important determinant. This applies particularly to the provisions of health, prevention of diseases, right to development and the right to an adequate standard of living.

The economic challenges are equally daunting, as future generations are not represented in any current 'marketplace'. People of the 21st century, might, for example, be willing to pay large amounts for the genetic diversity squandered in the

20th century. But they have no way to place their bids.

Economists both inside and outside the United Nations system are searching for ways to meet this challenge, developing new tools and measures by which they may take the future costs of ecological degradation into account. 'Environmental economics' may utilize discount rates which reflect future needs for resources squandered now, cost-benefit analyses, and risk assessment approaches. This work promises to improve our management of Earth's resources and secure future generations' use of Earth's bounty.

3. The special nature of children

There is no consensus on the age which is the upper limit of childhood. The International Labour Organisation and the United Nations Population Division refer to children as those who are under 15 years of age. The Convention on the Rights of the Child of 1989 states, however, that "a child means every human being below the age of 18 years unless, under the law applicable to the child, majority is attained earlier".

There are more than 1.7 billion children under age 15 in the world, they make up more than 32 per cent of the planet's population. They will inherit the Earth we leave them, but have little say in our management of Earth's resources.

More than 1.4 billion of these children (82 per cent of the total) live in the developing world, with 60 per cent in Asia. Children make up a smaller proportion of most industrialized nations' inhabitants. Europe, excluding the Soviet Union, contains 50 million more people than Latin America; but Latin America contains 66 million more under-15s than Europe. (See graph: all figures from UN Population Division's 1989 publication 'World Population Prospects 1988', using mid-1990 projections.)

The large numbers of children in the developing world will fuel population growth there for decades – growth precisely in those countries least able to feed their people and manage their resources. About 90 per cent of future population growth is expected to occur in developing States.

Rapid population growth has a bearing on the issue of intergenerational equity. This generation has a responsibility to preserve natural resources for future generations. It also has a responsibility not to create huge

POPULATION – A CHILD'S VIEW

Population control plays a heavy role in the environment. More people make the environment more untidy. This can cause sickness in the surroundings. For example, if you visit a house with a lot of children sometimes it becomes filthy and untidy. The same thing can happen to the world.

S. Asokan, Madras, India, from *Children Think Green* (1988), UNEP, Nairobi.

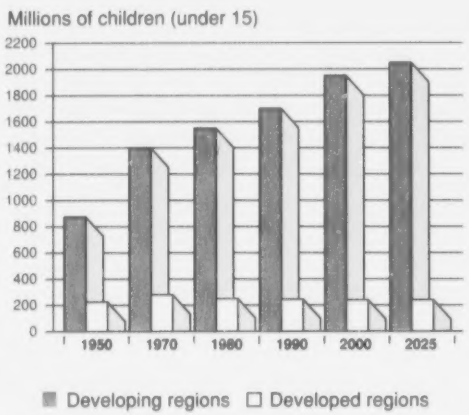
future generations which present levels of natural resources, even if sustained, could not support.

The 1990s may witness the birth of the 'largest generation' in the history of the planet with some 1.5 billion births over the next 10 years. Experts believe birth rates won't peak until the late 1990s. The sheer number of new-borns in poorer regions means we will struggle to cut child deaths, improve food and housing, and ensure development for all well into the 21st century (UNICEF, 1990).

In this regard, one fact is clear. Birth rates do not fall unless parents know their children will survive. Countries which have achieved substantial and sustained reductions in fertility rates are generally those countries which have already achieved a major reduction in child death rates.

The U.S. Academy of Sciences reached a similar conclusion in a major study, stating

Figure 1:
Size of child population in the world



Source: El-Hinnawi, E. (1990) drawn from data given by UN Population Division (1989) 'World Population Prospects 1988'. United Nations, New York.

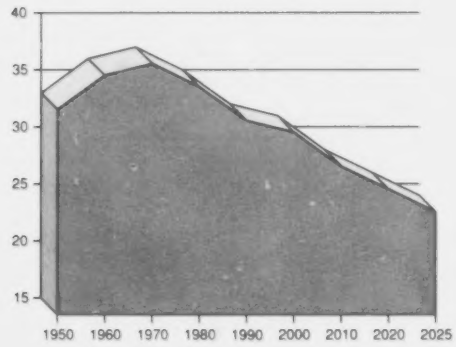
CHILDREN IN THE GLOBAL POPULATION

	Total pop. (in millions)	Under 16 (in millions)	% under 16	% of world's children
Africa	647	308	47	17
Latin America	448	171	38	9
North America	276	62	22	3
Asia	3,108	1,084	34	60
Europe	498	105	21	6
Oceania	26	7.5	29	0.5
USSR	287	78	27	4
World	5,292	1,815	34	

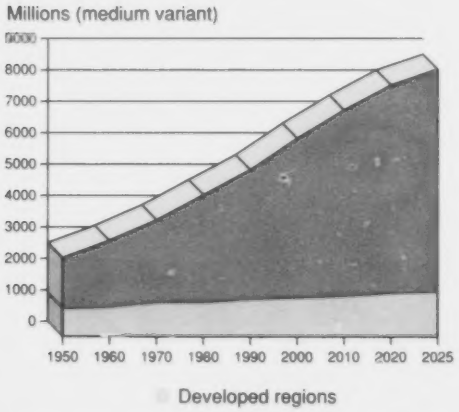
Source: UN Population Division (1989) 'World Population Prospects 1988', using mid-1990 pro ɔctions; figures rounded

that "policies and programmes aimed at reducing infant and child mortality may be an essential underpinning of government programmes for fertility control... as death rates are brought below 10-15 per 1,000 in present high-fertility, high-mortality countries, birth rates should be correspondingly reduced".

Figure 2:
Percentage of children (under 15) of total world population



Total population in the world



Source: El-Hinnawi, E. (1990) drawn from data given by UN Population Division (1989) 'World Population Prospects 1988'. United Nations, New York.

Examples of this simple lesson abound. Since 1960, the crude death rate in Thailand has dropped from 15 to 7 per 1,000, paralleled by a drop in birth rates from 44 to 22. In South Asia, Sri Lanka was the first country with a major reduction in child death rates followed by a major reduction in birth rates. It is noteworthy that if all of South Asia already had had Sri Lanka's low death rates and birth rates in 1988, 4.4 million fewer children would have died and 15 million fewer children would have been born that year.

Children, with the environment, are our future. Unfortunately, children's prospects, which had been improving steadily since the 1950s, slowed in the 1980s, and actually retrogressed in some areas. Today, in the developing world, excluding China, at least 200 million children under five live in absolute poverty (UNICEF, 1989a).

Yet, with debt-burdened governments trying to make ends meet, programmes for children – such as education – and funds for the environment are cut first and hardest. This makes little economic sense, for a good investment policy builds up productive 'human capital'. Only short-sighted economics permit a population to become malnourished, unhealthy and illiterate.

Examples from the 1950s and '60s abound. In regions as diverse as China, the Republic of Korea, Sri Lanka, Thailand and the Indian state of Kerala, focus on the poor majority, stressing improvements in subsistence agriculture, led to both better rural diets and rising demand for essential industrial goods. That demand in turn helped generate more employment and improved diets in urban areas. Clearly, agriculture-led development strategies can, by increasing rural incomes, also improve nutrition and catalyse other parts of the economy, enhancing demand for goods (UNICEF, 1989d).

But agriculture depends on both the environmental resource base and an educated farming community. Researchers are find-

ing strong links between improved education and enhanced social development. The World Bank has concluded that investment in education yields a return that is normally higher than the investment in physical capital, and that four years of primary education usually increases farm productivity an average 10 per cent or more, other things being equal (UNICEF, 1990).

Education not only makes people better farmers but also better managers of all natural resources. And, clearly, education must focus on children. Returns are particularly high for educational investment in the poorest countries (UNICEF 1989d). The Republic of Korea, where the economy has developed so strongly in the last decade, is a good example. Its investments in primary education in the 1960s were among the world's highest.

Children are different

The environmental resource base has been debased by the adult world's activities. Children are different, they are affected more severely by environmental degradation but have little to do with causing that degradation.

Obviously, children are more fragile, more vulnerable to any sort of stress than older members of their species. Their bodies are more vulnerable to disease and malnourishment, and less resistant to environ-

GROWING CROPS WITHOUT LAND

The township of Jerusalem is one of many sprawling new settlements springing up around the Colombian capital of Bogotá. Its inhabitants are poor – usually unemployed – and have few assets beyond a house. Thus, they have no land upon which to grow food for their children, and little money with which to buy it.

But more and more families are harvesting crops on their rooftops, using the hydroponics technique. Hydroponics allows them to grow plants rapidly using fertilizer and a little water. Tito Lopez claims that hydroponic methods have increased his family income by 15 per cent and "probably improved our diet by 30 per cent. Before, we only ate cabbage, onions, bananas, rice and flour. Now we also have Swiss chard, radishes, lettuce, tomatoes, celery and carrots".

Many of Bogotá's poor families are now raising food at one-third its market cost, while producing 20 times more per square metre than traditional agriculture. It costs families less than US$5 to set up a one square metre plot of seedlings, and under US$9 a year to maintain it. Surplus produce is sold at a guaranteed price through a new neighbourhood co-operative.

The simplified hydroponics system has been developed by an NGO, Las Gaviotas Centre, which specializes in low-cost technologies. The pilot project, meant to be expanded throughout Latin America, is partly funded by the United Nations Development Programme.

Robson, Emma (1989). *World Development*. UNDP, New York.

mental pollution (see Chapter II). Because children's minds and bodies are growing, disease and malnourishment exact a far more severe toll on children than on adults. Thus, what the family and society do to young children largely determines their personalities, the qualities of their adult life, and their contributions to society.

Children have little or no economic or political power. Their access to health care and sufficient resources depends largely on the concern and power of their parents or guardians, as well as the concern and resources of their government. What the WCED report said of future generations is obviously true of children alive today: they "do not vote; they have no political or financial power; they cannot challenge our decisions" (WCED, 1987).

The Convention on the Rights of the Child is an important departure from previous international treaties on the state of children. This Convention, negotiated over 10 years, attempts to establish the universal and inalienable *rights* of children. Realizing the obligations of the Convention means to give

ONE MONK, ONE VILLAGE

"I particularly make sure I get the children involved in plant nursery work", explained Buddhist monk Kiranthidiye Pannasekera Thera. "The older generation destroyed the forests; now the children are going to recreate those forests by planting trees exactly on the spots their fathers cut them down."

The 6,000 seedlings provided by the monk's nursery, used to reforest a crucial 2.5 hectares of hilltop in the south-western Sri Lankan village of Galahitiya, is one example of the environmental reclamation of this remote village. When the monk arrived at the village in the early 1980s, he conducted a quality-of-life survey which revealed malnutrition, poor sanitation, watershed deforestation, landlessness and lack of health care. The only positive result of his survey was the finding that 99 of the 100 village families were willing to work to improve the village, given a bit of help.

Monk Thera became a link between the Government and the villagers, nagging and encouraging both. He helped villagers write letters which got them land grants; he encouraged them to boil water, build latrines, plant gardens and build a road to bring services in and make health care more accessible.

Sri Lankan villages have produced many such human catalysts or *animateurs* from all walks of life, and in 1984, 130 environmental groups from all over the nation came together to form the Sri Lankan Environmental Congress, with the Galahitiya monk as its secretary.

Of his own work in the village, Thera said: "In a sense I have launched a war. I am not doing badly at all. I shall show others how to win this war".

Timberlake, Lloyd (1987). 'Only One Earth'. BBC, London.

children what they have a right to, not as deeds of charity.

States parties to the Convention "recognize that every child has the inherent right to life". The pact calls on States to "ensure to the maximum extent possible the survival and development of the child".

It also calls on States to recognize the "right of the child to the enjoyment of the highest attainable standard of health". It requires States to take appropriate measures "to diminish infant and child mortality". Parties pledge to combat disease and malnutrition "through *inter alia* the application of readily available technology and through the provision of adequate nutritious foods and clean drinking water, taking into consideration the dangers and risks of environmental pollution".

4. Children as forces for change

There is another, more encouraging, way in which children are different from adults. They have boundless energy and open minds. They can be powerful forces for positive change, particularly in the field of environmental reclamation and enhancement.

Former Norwegian Prime Minister Gro Harlem Brundtland and her fellow commissioners chose in 1987 to present their WCED report, *Our Common Future*, to the planet's young people. She said at the time:

> "Securing our common future will require new energy and openness, fresh insights, and an ability to look beyond the narrow bounds of national frontiers and separate scientific disciplines. The young are better at such visions than we, who are too often constrained by the traditions of a former, more fragmented world. We must tap their energy, their openness, their ability to see the interdependence of issues".

Young people's concern over the state of their environment – and their willingness to voice this concern – was a key element in the awakening of environmental awareness that led to the 1972 United Nations Conference on the Human Environment in Stockholm. That concern continues to mount.

Groups of young people have been in the forefront of campaigns for environmentally sound and sustainable human progress. Recently, major conferences and campaigns on the environment were organized by youth groups such as the Council of European National Youth Committees, the European Youth Forest Action, the International Association of Agricultural Students, the International Union of Students, the International Youth Federation for Environmental Studies and Conservation, the Peace Child Foundation, the Youth Ecological Centre, and Youth for Environment and Service (Centre for Our Common Future, 1989).

There are many examples of grass-roots environmental programmes for youths, such as forestry projects led by schoolchildren in Tanzania, Kenya and India. These and programmes in other tropical nations have seen the planting of millions of trees, most with high survival rates. Children have planted them for fuelwood, for fruit, and for seeds and seedlings to take home to parents' farms (Eckholm, 1984).

Youth-led movements have sprung up in the industrialized world also. Environ-

mental concerns in the North have given rise to a movement known as 'Green Consumerism', whereby consumers go to great pains to seek out environmentally sound products. John Elkington, co-author of the *Green Consumer Guide*, maintains that "children, especially young adolescents, are the driving force of this movement. They are the ones telling their mothers what to buy and why to buy it, and making their parents feel guilty if they are not working to save the planet" (Elkington, 1989).

5. The economic and social environment

The world population numbers more than 5 billion; during the next century, the population is expected to more than double, with 90 per cent of that growth in the developing nations (WCED, 1987; United Nations Population Division, 1989).

How can 10 billion people be fed, when the agricultural systems called upon to feed 5 billion are degrading topsoil, polluting waterways and destroying forests? How can 10 billion be provided with energy, when systems meant to provide energy for 5 billion have already committed Earth to global warming? Can industry find the raw materials to produce goods for 10 billion, without creating excess pollution that may undermine the health of a large proportion of the 10 billion?

Present global development patterns have already damaged the global resource base. They threaten further damage in both the industrialized and the developing nations. Cleaning up the damage and limiting further destruction while populations grow will be expensive.

Much of the developing world suffers accelerating desertification and deforestation; it will suffer from other global syndromes, particularly climate change and ozone depletion. Poorer countries already struggle to cope with these environmental challenges. And their situations are often getting worse, not better.

Economic performance in the 1980s has varied widely among countries and continents. After a sharp recession at the beginning of the decade, the industrial countries are well into their seventh year of uninterrupted growth, although at rates lower than those of the 1950s and '60s. In parts of Asia, where much of the world's poverty is concentrated, economic growth in the 1980s has been greater than ever before. But in Africa and Latin America, hundreds of millions of people have seen economic decline and regression rather than growth and development. In some countries in Latin America, real per capita GNP is less than it was a decade ago. In some African countries, it is less than it was 20 years ago (World Bank, 1989).

In general, the 1980s have seen economic deterioration in much of the developing world. This has resulted both from external events beyond nations' control, as well as policy decisions on the part of developing world governments. The decade has seen escalating external debt, falling prices for raw commodities, and adjustment policies that have exacted a severe toll on the poor.

Both in Africa and in large parts of Latin America, development has stalled or been forced backwards. Average incomes have fallen 10 per cent during the 1980s in most of Latin America, and by 20 per cent in sub-Saharan Africa. In many urban areas, real minimum wages have declined by as much

as 50 per cent (UNICEF, 1990). Many Asian nations have done better in terms of national economic indicators, but the region is still the focal point of poverty. Approximately 40 per cent of the young children who die annually in the world, 45 per cent of the children who are malnourished, 35 per cent of those not in school, and over 50 per cent of those who live in absolute poverty are found in the three nations of Bangladesh, India and Pakistan (UNICEF, 1990).

In the 37 poorest nations, spending per head on schools has fallen by about 25 per cent. Health spending per person has declined in more than three quarters of African and Latin American nations. In several countries in Latin America and sub-Saharan Africa, the historical decline in infant mortality rates has stopped and been reversed, and the incidence of malnutrition has increased (UNICEF, 1990).

The president of the Inter-American Development Bank has noted that in some Latin American nations the standard of living has slipped back to what it was 20 years ago:

> "It does not take much imagination to realize that behind this statistic are plummeting real wage levels, soaring unemployment (some of it open, some hidden), increased levels of marginality and acute poverty – in short, an erosion of every measure of social well-being. Today, one third of Latin America's population – 130 million people – live in dire poverty" (UNICEF, 1989d).

The flow of money from rich to poor nations has been reversed. Ten years ago, a net $40 billion flowed from the Northern hemisphere to the developing nations in the South. Today, taking into account loans, aid, repayments of interest and capital, the South is transferring at least $20 billion a year to the North. If the effective transfer of resources implied in the reduced prices paid by industrialized nations for the developing world's raw materials is taken into account, the annual flow from the poor to the rich could be as much as $60 billion each year (UNICEF, 1989d). Public spending on both children and the environment suffer.

The total debt of the developing world was $1,309 billion at the end of 1988 (OECD, 1989). On average, repayments now claim almost 25 per cent of the developing world's export revenues. Moreover, as outgoings have risen, income has declined. The developing world still depends on raw materials for most of its export earnings. But in the last 10 years real prices for the developing world's principal commodities – including fuels, minerals, jute, rubber, coffee, cocoa, tea, oils, fats, tobacco and timber – have fallen by approximately 30 per cent (UNICEF, 1989d).

Clearly, a large part of the developing world is moving backwards. And both children and the environment are bearing the brunt of this reversal, meaning the next generation is paying for its parents' mistakes. Malnutrition is worsening in terms of sheer numbers as a result of the debt crisis and consequent economic adjustment policies. In many nations, government expenditure on food subsidies has declined.

With regard to children, Chile's experience in 1983 shows the speed with which malnutrition can affect children's health. At that time, the economic crisis was deepening, and nutritional programmes faced restrictions. The amount of milk distributed by the supplementary feeding programme was 31 per cent lower in 1983 than in 1982, and the additional food distribution to malnourished children was reduced by 10 per cent.

The results surfaced quickly. Malnutrition figures for the months of February, March and April of 1983 showed a stagnation in the nutritional status of children younger than five months, and a deterioration in that of children 6-23 months old. The yearly fig-

ures confirmed this negative trend (Cornia, 1988).

Figures from Jamaica confirm the connection between spending cuts forced by adjustment policies and the deterioration in children's health. In 1978, less than 2 per cent of the children admitted to the Bustamente Children's Hospital were suffering from malnutrition, and 1.6 per cent from malnutrition-related gastro-enteritis. By 1984, when the full effects of the adjustment policies were being felt, the figures for malnutrition-related admissions had doubled, to almost 4 per cent. Gastro-enteritis admissions had tripled to nearly 5 per cent (Cornia, 1988).

The financial crisis in the developing world also leaves little cash available for sustainable management of the environmental resource base.

Despite recent Central American efforts to manage natural resources more effectively, "All the governments of the region remain overwhelmed with short-term economic and political crises. Environmental and natural resource management rank extremely low on the lists of immediate and pressing priorities. Moreover, even where the will exists to address particular resource management problems, all governments of the region face serious shortages of trained professionals with expertise in natural resource management and of current budgets to support even the small numbers of these professionals who do remain in the region", according to a report on the region by the International Institute for Environment and Development (Leonard, 1987).

Finding similar, and often more extreme problems of governmental natural resource management in sub-Saharan Africa, the World Bank notes that "to overcome the financial and institutional constraints, substantial concessional assistance from abroad will be needed. Since there are global benefits in resource conservation, this seems amply justified" (World Bank, 1989).

Education also tends to be hard hit by spending cuts in times of recession. This has an effect both on the general future of children and on their interaction with their environment. In two thirds of the developing countries for which adequate data are available, real public spending per primary school pupil has dropped between 1980 and 1986, while in most countries private spending on education has declined also (UNICEF, 1989d).

This has meant a decline in primary school enrolment, a decline that hits hardest at the children of the poorest. Since education is one of the principal determinants of income levels and productivity, such reductions affect income distributions for both present and future generations. The children who have borne the heaviest burden of debt and recession in the 1980s will continue to bear it well into the future.

Why have the poor and most vulnerable suffered most? There are two main reasons. First, the poor have the least economic 'fat' with which to absorb the blow of recession. Often, the very poor spend three quarters of their income on food, with much of what remains needed for fuel and water, housing and clothes, bus fares and medical treatment. Any cut in real incomes means going without some basic necessities.

Second, the poor also have the least political 'muscle'. Consequently, the services that are most radically pruned, with some honourable exceptions, have not been the ones of most concern to the more powerful sectors of society. Major hospitals, universities, national airlines, prestige development projects and the military rest intact. The most drastic spending cuts have instead come at the expense of clinics, free primary education, and food and fuel subsidies – services on which the poor are most dependent and

which they have least opportunity to replace by any other means (UNICEF, 1989d).

Military spending still claims more funds than health care in most of the world's nations. Twenty-nine countries, most of them in Asia, spent more public funds on their military in the 1980s than on health and education combined. An additional 61 nations spent more on their military than on health care. Only 44 countries, most of them industrialized, spent more on health than on military programmes (Sivard, 1989).

Given that threats to global ecosystems are not yet widely viewed as 'security threats', natural resource management receives only the tiniest fraction of the money now spent on military activities. The Tropical Forests Action Plan being promoted by various members of the United Nations system and non-governmental organizations would cost $1.3 billion a year – equivalent to half a day's world-wide military spending (WCED, 1987).

Implementing the United Nations Action Plan to Combat Desertification would require $1.8 billion per year above current expenditure, slightly more than half a day of military spending. Eradicating malaria, which claims the lives of one million children every year, would cost $1 billion – much less than half of one day's military spending (El-Hennawi, 1986).

By 1990, the governments of the developing world as a whole were devoting half of their total annual expenditures to the military and debt servicing. These two activities cost the poorer nations of the world almost 1 billion dollars per day, more than $400 per year for each family in the developing world (UNICEF, 1990).

There has been mounting concern that the debt crisis and misallocation of resources have caused governments in the developing world to over-use environmental capital in an effort to produce cash crops, timber and other resources for export. People thrown out of work in declining economies are being forced into marginal subsistence farming, charcoal-making, over-fishing, and other unsustainable uses of resources. In overtaxing their natural resource base to produce exports, developing nations are subsidizing the purchasers of these exports, assuming the environmental costs themselves.

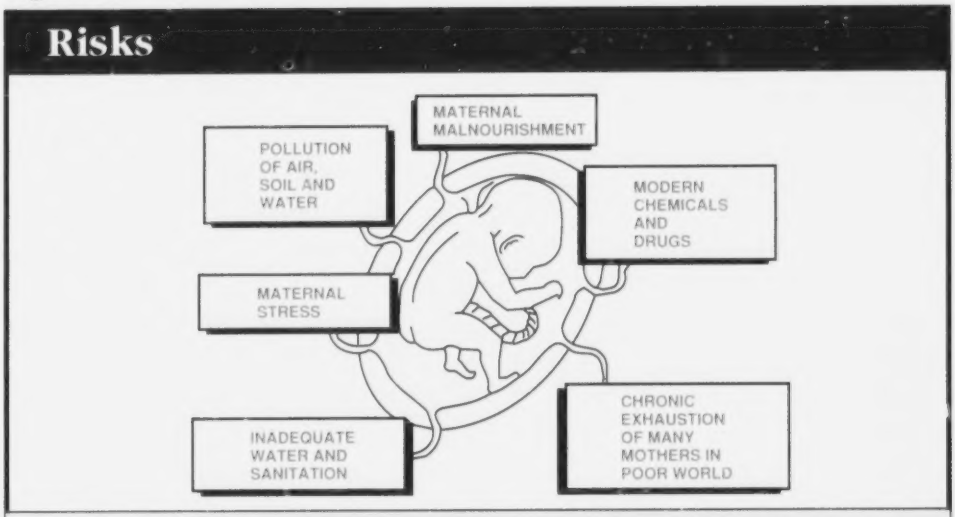
The misuse of these resources compromises the rights of children and future generations to benefit from them. Cuts in social services are also denying children their rights to share in resources such as safe water and food supplies. Neither a growing child nor a degraded environment can wait for an economic turnaround.

The developing world has not been alone in cutting social services. The 1980s saw increased income discrepancies in many industrialized countries. In both the United States and the United Kingdom, the number of homeless families has doubled over the past 10 years. The number of children living in poverty in the United States has risen by more than three million over those same 10 years – from 11 per cent to 15 per cent of the child population (UNICEF, 1990).

Social development, especially health and education, has long been a high priority in European countries with centrally planned economies. But these countries also experienced a slow-down in progress during the 1980s, especially in such areas as infant mortality and life expectancy (UNICEF, 1989a).

In many parts of the world, poor children are growing poorer in a physical environment which is itself being rapidly degraded. Where will the resources be found to cope with this problem?

Figure 3:



A CHILD'S ENVIRONMENT: LAYERS OF OPPORTUNITY

Imagine a new-born child at mother's breast. The child's micro-environment does not extend beyond the mother and the room they inhabit. But the child's chances of survival are threatened by such things as poor sanitation, overcrowding and poor ventilation. Things which can improve those chances include oral rehydration therapy, immunizations, basic drugs, breast-feeding, and improving mother's education level. These are immediate and effective measures affecting the child's well-being, although they leave the sources of problems in the environment untouched.

Another layer removed is the child's meso-environment, containing threats such as ground-water pollution, acid rain, air pollution, chemical misuse and deforestation. These have more effect on the child as it grows and moves out into the environment. Efforts to protect the child's welfare at this level involve such activity as improved water supply and sewerage, local pollution control, education and social forestry. These efforts improve the environment at the community level, and in fact require local, informed community participation. This, in turn, allows for social mobilization on national and global issues.

Finally, there is the child's macro-environment, beset with such threats as global warming, ozone depletion and sea-level rise. These threats are met with international treaties and national laws and environmental controls.

This vision of layers of concern and layers of actions brings out the divisions and complementarity of the activities of UNEP and UNICEF. UNEP is concerned primarily with the global and national environment. UNICEF is concerned primarily with the micro-environment of children. There are many opportunities for co-operation, especially at the meso-environmental level.

El-Hinnawi, E. (1990), personal communication.

Chapter II:

Environmental quality and children– today and tomorrow

Even before conception, the 'child' – in the form of human germ cells – is vulnerable to noxious factors in the environment. From fertilization onwards, the developing embryo is involved in a continuous relationship with its surroundings, a relationship which extends throughout life.

The genetic make-up of an individual controls its physiological and biochemical functioning, and helps to determine his or her appearance, size, and, perhaps, intellectual capacity. But DNA is not the only factor in foetal development. Environmental factors play a role.

1. The child in the womb

ven in the relatively sheltered environment of the mother's uterus, the developing baby is far from completely protected. Some 60 per cent of variations in birth weight are attributable to factors within the foetus's environment (Ebrahim, 1982). Of these, nutrition is by far the most important. The nutrition of the foetus obviously depends on the mother's food supply, metabolic activity and uterine blood supply, all of which must be adequate to permit the foetus to grow to its optimal size. The unborn child may receive inadequate nutrients from a mother who is underfed, overworked or in poor health.

An infant's birth weight is the single most important determinant of its chances of survival and development. Because birth weight depends on the health and nutritional status of the mother, the proportion of infants with a low birth weight (less than 2,500 grammes) accurately reflects the health and social status of women and the communities into which children are born.

In communities where malnutrition is a chronic problem, or during periods of food shortages or drought, pregnant women rarely get enough to eat, and foetal growth suffers. Approximately 51 per cent of pregnant women in the world suffer from nutritional anaemia (low haemoglobin levels due to poor diet); the percentage in developing countries is 59, much higher than the 14 per cent encountered in industrialized countries (DeMaeyer and Adiels-Tegman, 1985).

Some 22 million (or about 16 per cent) of the 140 million infants born each year in the world have a low birth weight. At least 20 million of these infants are born in developing countries, the majority (more than 13 million) in South Asia and the rest in Africa, Latin America and East Asia (WHO, 1987;

UNICEF, 1989). The Global Strategy of Health for All, launched by the World Health Assembly, aims at reaching a target birth weight of at least 2,500 grammes for 90 per cent of new-born infants, and an adequate growth of children as measured by weight-for-age goals, by the year 2000 (WHO, 1987).

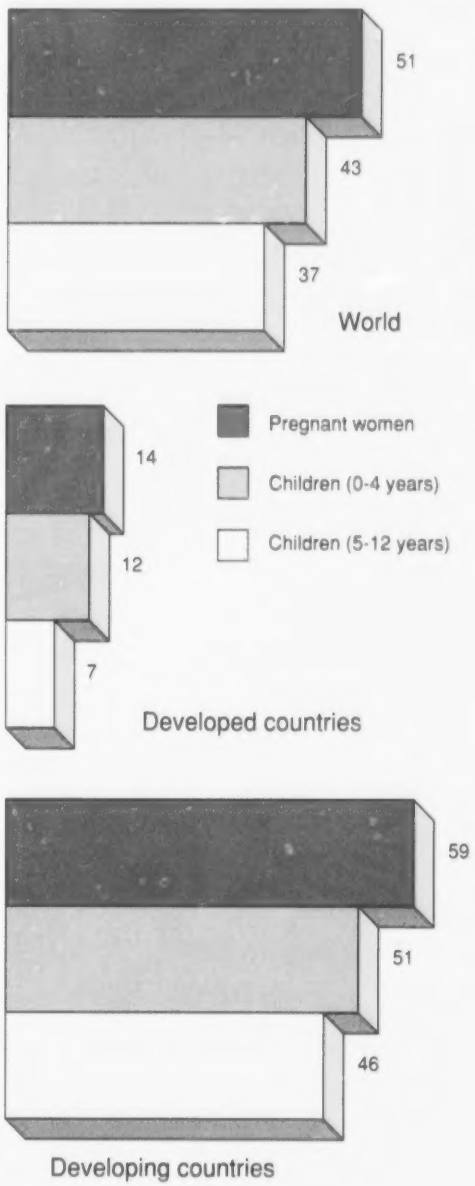
The environment and the unborn child

The environment to which a pregnant woman is exposed has a marked effect on the development of the embryo and the foetus. The effects of exposure to chemicals have been well documented. The first systematic reports linking reproductive effects to a chemical, lead, were published towards the end of the 19th century. Unusually high rates of infertility, spontaneous abortion, still-birth, neonatal death and convulsions in children were recorded in lead-working communities in many parts of Europe (Barlow and Sullivan, 1982). These reports resulted at the turn of the century in the banning of women from work in many lead-using trades.

A vast amount of scientific information is available on the short-term effects of well-known chemicals hazardous to human health. If an individual is exposed to enough arsenic to cause death or illness, for example, the effects are rapid and obvious. But little is known about what happens to individuals exposed to toxic or hazardous chemicals at very low concentrations over 20 or 30 years. Effects may appear a long time after exposure either to a large dose over a short period or to a relatively small dose over an extended period.

However, the consequences can be measured among the larger population in terms of disease and death and in terms of physiological changes. Genetic mutations (the production of new, mostly detrimental, hereditary traits) may also have chemical causes, and they are permanent.

Figure 4:
Prevalence of anaemia (%)



Source: El-HInnawi, E. (1990). Drawn from data given by: E. DeMaeyer and M. Adiels-Tegman (1985) 'The prevalence of anaemia in the world'. *World Health Statistics Quarterly*, 38,302.

Cancer and birth defects are among the other hazards to health that may result from long-term exposure to toxic substances. Birth defects occur in 2-3 per cent of all births. Of these, 25 per cent have underlying genetic causes, while 5-10 per cent result from the influence of four classes of known causes: radiation, viruses, drugs and chemicals. The remaining 65-70 per cent stem from unknown causes, but may follow from an interplay of several environmental agents with genetic factors (Kurzel and Cetrulo, 1981; Kalter and Warkany, 1983).

The effects of exposure to a chemical pollutant depend on the period and severity of exposure and the type of chemical to which the mother is exposed. Some types of exposure may affect the foetus but not the mother. This has been verified in animal studies as well as in studies following some major accidents, such as epidemics of methyl mercury poisoning through seafood in Minimata and Niigata, Japan, in 1953 and 1964 respectively, and through dressed seed in Iraq in 1956 and in 1960. Following these accidents, many infants developed cerebral palsy (now known also as Minimata disease).

It is generally agreed that intra-uterine methyl mercury poisoning brought on these diseases. Although the foetus is separated from maternal blood circulation by the placenta, some chemicals, such as methyl mercury, can be transferred through the placenta in high concentrations.

Recent studies (e.g. Skerfvig, 1988) found a close correlation between mercury in the blood cells of mothers and in those of their new-born babies. But the babies had even higher levels of mercury than their mothers: 47 per cent higher on average. This may be due to variations in the binding of mercury in the blood cells, or accumulations of mercury in babies' central nervous systems.

Pesticides (e.g. DDT, DDE, Lindane, Dieldrin, etc.) can be transferred through the placenta and harm the foetus. Large amounts of 2,4-D (2,4-dichlorophenoxy acetic acid), 2,4,5,-T (2,4,5-trichlorophenoxy acetic acid) and chemically related Silvex have been used as weed-killers. Both 2,4,5-T and Silvex contain dioxin as a contaminant. There is laboratory evidence that dioxin is toxic to embryos, affects reproduction and causes birth defects and cancer in animals.

Polychlorinated biphenyls (PCBs) can also pass through the placenta and damage the foetus. Several pregnant Japanese women ate rice oil contaminated with PCBs leaked from a heat exchanger in 1968. They gave birth to infants who suffered retarded growth. A nine-year follow-up study revealed some nerve and developmental impairment. In 1979, a mass poisoning occurred in Taiwan from cooking oil contaminated with PCBs. A 1985 study of the incident revealed that children born to exposed women suffered various forms of retarded growth (Rogan *et al.*, 1988).

Carbon monoxide (CO) diffuses across the placenta and has a half-life of 1.5-2 hours (that is the time it takes for half of the CO in the body to be eliminated). The haemoglobin in human blood, which transports oxygen, has about 200 times more affinity for CO than for oxygen; therefore, relatively small amounts of CO can significantly reduce the blood's ability to carry oxygen to tissues. The amount of CO in the blood is a function not only of the CO concentrations in the air, but also of the duration of exposure and the individual's physical status. Some population groups suffer greater impacts than others.

The CO concentration in the foetus generally exceeds that in the mother by 10 to 15 per cent. This leads to a considerable reduction in oxygen concentrations in the foetus. The decreased oxygen level is associated with a redistribution of foetal blood to the brain, heart and adrenals. This may lead to a decrease in foetal weight, an increase in perinatal mortality and brain damage.

Although the 'mean' urban carbon monoxide concentrations are 3-10 parts per million (ppm), levels up to 50-100 ppm may be found in areas of heavy traffic. Within the framework of the Global Environmental Monitoring System (GEMS), the WHO/UNEP Urban Air Programme provided data from different sources for 15 cities between 1980 and 1984. All the data exceeded the WHO guideline (8-hour CO concentration of 10 ppm) at some time during that period. In eight of the 15 cities, the average 8-hour CO concentrations over the five-year period exceeded the WHO guideline.

Pollution by choice

The toxic substances that contribute most to foetal damage are not necessarily the products of industrial or agricultural pollution. Many mothers deliberately expose foetuses to substances that can cause a great deal of harm.

Alcohol has been linked to a variety of congenital malformations and to low birth weight. More than 20 mental and physical defects in new-born babies, some of which threaten the life of the child, have been associated with drinking during pregnancy. This is the so-called foetal alcohol syndrome (Norwood, 1980; Newland, 1981).

Cigarette smoke exposes the unborn baby to high levels of carbon monoxide, hydrogen cyanide, cadmium, nicotine and polycyclic aromatic compounds such as benzo-a-pyrene, which can cross the placenta. Smokers generally produce smaller babies than non-smokers, and have a higher incidence of spontaneous abortion, premature delivery and perinatal mortality (Meberg, 1979; Kurzel and Cetrulo, 1981; Cnattingius *et al.*, 1988).

The more the mother smokes, the greater the effect on the infant. The risk of perinatal death increases directly with the smoking level: by 22 per cent when a mother smokes less than a pack a day, and by 44 per cent when a mother smokes more than a pack a day (Norwood, 1980). Infants born to mothers who smoke a pack or more per day are more than twice as likely to suffer low birth weight than babies born to non-smokers (Ebrahim, 1982).

When a pregnant woman both drinks and smokes cigarettes, she may aggravate some of the effects associated with alcohol consumption. A French study found that women who both drank heavily and smoked had 50 still-births per 1,000 deliveries, twice the rate experienced by heavy drinkers who did not smoke (Newland, 1981).

Tobacco smoke is a significant indoor pollutant. In recent years, there has been increasing concern that exposure to 'sidestream' smoke (the so-called 'passive smoking') may pose some risk to non-smokers (Hirayama, 1981; Leaderer *et al.*, 1984).

Biomass fuels

The combustion of fuels, whether for cooking, heating water or space heating, is another source of indoor air pollution. In urban homes, elevated concentrations of CO have been found in kitchens having gas-fired water heaters. Unvented, portable, kerosene-fired space heaters emit CO, carbon dioxide, nitrogen oxides and fine particles. Wood-burning fireplaces produce several pollutants, the quantities of which depend on the type of wood burned and the design of the fireplace.

Biomass fuels – wood, crop residues, dung, etc. – are used by about half the world's population as an important, often the only, source of domestic energy. The emissions from these fuels contaminate the indoor environment, especially in rural communities of developing countries. These emissions contain pollutants harmful to health, including a number of cancer-causing agents, especially benzo-a-pyrene, and gaseous pollutants such as carbon monoxide and formaldehyde (WHO, 1984; Smith, 1986).

These pollutants can have considerable impact on women, especially pregnant women, who may spend much time at home in the kitchen or in front of fireplaces, particularly in rural areas.

AIDS

The human immunodeficiency virus (HIV), which causes AIDS, is apparently a relatively recent addition to the human environment. AIDS kills people of all ages, but is a growing threat to new-born children and infants. At least 1.5 million women world-wide are infected with the virus, and babies born to such women have a 25–40 per cent chance of being infected before or during birth. These children are almost certain to die by the age of five. In Africa, an estimated 1 million women are infected with HIV, and in one East African country, 14 per cent of all AIDS cases are under four years old (UNICEF, 1990).

As parents die of AIDS, the number of 'AIDS orphans' steadily grows. The disease is also placing a great strain on the health care facilities of many poor African countries, and threatens to leave less funding, fewer hospital and clinical facilities and fewer trained health workers available for children's many other health problems. While an effective AIDS vaccine may be some years off, many deaths can be prevented through broad-based information campaigns involving health and social workers, teachers, religious leaders, the media, professional organizations and many non-governmental organizations. Already, many national AIDS control programmes have been established under the auspices of the WHO Global Programme on AIDS.

More research is needed on AIDS in the tropics. It is known that the infectious tropical diseases react with one another to weaken the human immune system. But, except for tuberculosis, little is known about how they react with AIDS or HIV infection. Does the reaction lead to a more severe disease pattern or does it make for more rapid transmission of one or both diseases? Studies are under way to see if pregnant women who are HIV-positive and also have malaria at the time of delivery are more likely to transmit HIV to their infants, and to see whether HIV-positive babies have a greater risk and severity of malarial infections.

Ionizing radiation

Children, both before and after they are born, are particularly sensitive to ionizing radiation. High doses of radiation can kill cells, damage organs and cause death quickly. At low doses, radiation can initiate only partially understood chains of events which lead to cancer or genetic damage. The damage done by high doses normally appears within hours; that done by lower doses may take many years to emerge. In fact, the hereditary malformations and diseases caused by genetic damage may take generations to show. The children, grandchildren and remoter descendants of the people originally exposed to radiation may be affected.

Small doses of radiation to children's cartilage can slow or halt bone growth and cause deformities. Irradiation of children's brains during radiotherapy has caused changes in character, loss of memory, and – in very young children – dementia and idiocy. Unborn children are particularly vulnerable to brain damage if their mothers are irradiated between the eighth and fifteenth weeks of pregnancy.

Cancer is the most serious effect of low-level radiation, although information on human cancers caused by radiation remains limited. Leukaemia seems to be the first cancer to emerge in a population after irradiation. The UN Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) makes two basic assumptions on this topic:

– First, there is no threshold below which there is no risk of cancer. Any dose, however small, raises the re-

cipient's chances of getting cancer. Every additional dose will increase those chances further.

– Second, the risk rises in direct proportion to the dose. Doubling the dose will double the risk, etc.

Some studies indicate that children are more likely to die of cancer if their mothers have been X-rayed during pregnancy; but UNSCEAR is not yet convinced that a cause-and-effect link has been proved. There is some evidence that people exposed to low doses do suffer detectable chromosome damage in their blood cells. But the biological significance and health consequences of such damage have not been established (UNEP, 1985).

2. Infants, young children and the environment

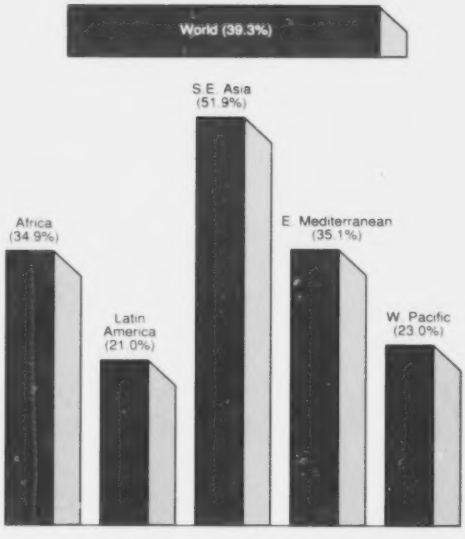
The relationship between children and their environment is not a static, passive process; it is a complex, continuous interplay of many factors, with the children themselves taking an increasingly active part.

The social environment that greets a child at birth exerts a powerful influence on its chances of living through infancy. The physical environment outside the womb presents dangers to the new-born; whether these become life-threatening depends in large measure on how well the family and the community can manage them.

In wealthier communities, the majority of children who die before they are a year old die of a condition they had at birth – physical immaturity, a congenital deformity, a genetic disease, or a birth injury. The children of poorer neighbourhoods have a large share of these problems too, but the impact of these handicaps is swamped by a tidal wave of malnutrition and infection awaiting them outside the womb.

Childhood illness and death are much higher in the poorer strata of society. Illiteracy of mothers, culturally determined attitudes with respect to health and medical care, lack of basic knowledge and awareness of health problems, poverty and the inaccessibility of

Figure 5: Percentage of malnourished children (aged 6-60 months)



Source: El-Hinnawi, E. (1990). Drawn from data given by J. Haaga et al. (1985) 'An estimate of the prevalence of child malnutrition in developing countries'. *World Health Statistics Quarterly*, 38,331.

health facilities all contribute to these high rates. Women's education and awareness of the importance of hygiene, of the use of techniques such as oral rehydration therapy (ORT) in managing diarrhoea, and of the importance of timely immunization can save millions of children's lives each year.

Nutrition

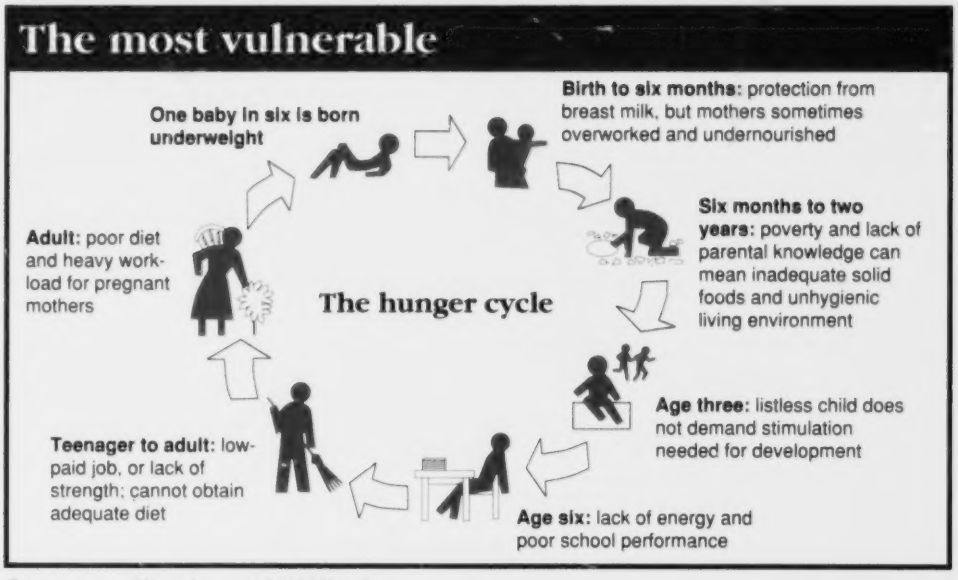
In numerical terms, malnutrition is the most serious condition affecting the health of children, particularly in the developing countries. Surveys in different regions of the world indicate that at any moment an estimated 10 million children are suffering severe malnutrition, and a further 200 million are inadequately nourished (Ebrahim, 1985; WHO, 1987).

Malnutrition does not usually kill outright. But malnutrition makes a body more prone to infection, and infection may exacerbate malnutrition. A malnourished child has less resistance to infection in the first place, meaning minor illnesses may become life-threatening. At the same time, every illness threatens to produce the combined effects of a poor appetite, parental withholding of food in the mistaken belief that this may cure the child, and the body's demand for more nourishment to fight the disease.

The best protection for infants against both malnourishment and infection is breast-feeding. Breast-feeding protects children from malnutrition for the first few months of life. Also, a mother's milk contains antibodies that increase her child's resistance to infection. Breast-feeding has a contraceptive effect, and the continuation of breast-feeding can be of great importance in controlling fertility and, hence, population growth.

Although a fairly high proportion of babies were breast fed in Europe and in North America up until the 1920s and '30s, the proportion fell to 30 per cent in Europe in 1970 and to 26 per cent in North America in 1973. However, the proportion of breast-fed babies then began to increase in these countries. By the early 1980s, about 80 per cent of women in Norway were again breast-feeding for at least three months (Liestol *et*

Figure 6:


The most vulnerable
One baby in six is born underweight
Birth to six months: protection from breast milk, but mothers sometimes overworked and undernourished
Six months to two years: poverty and lack of parental knowledge can mean inadequate solid foods and unhygienic living environment
Age three: listless child does not demand stimulation needed for development
Age six: lack of energy and poor school performance
Teenager to adult: low-paid job, or lack of strength; cannot obtain adequate diet
Adult: poor diet and heavy work-load for pregnant mothers
The hunger cycle

Source: UNICEF *News*, Issue 113 (1982) p. 9

al., 1988), with similar high percentages in Sweden and other European countries. In North America, the proportion reached about 60 per cent (WHO, 1987).

In rural areas of the developing countries, almost all children are breast-fed, but the duration of breast-feeding varies considerably from one region to another, being shorter in Latin America than in South Asia or Africa (WHO, 1987). But in urban and semi-urban areas in developing countries, breast-feeding has been declining. In these areas, many young women who are educated and relatively affluent are abandoning breast-feeding in favour of bottle feeding.

Some of these wish to appear 'modern', by emulating the fashions of the West. Others believe – wrongly – that breast milk is inferior to artificial substitutes (Short, 1984; Oni, 1987). Many hold salaried jobs, which do not allow breast-feeding in the office or factory. Since these young women tend to be the trend-setters in their community, their influence spreads to poor urban and rural women, who are the least likely to use modern contraceptives and whose infants have the most to gain from breast milk. As they, too, seek paid work, they buy the increase in family income at the price of bottles and milk – and sometimes the baby's life.

An increase in the rate of breast-feeding is beneficial for the developing countries with regard to both economy and health. The acceptance of the WHO International Code of Marketing of Breast-milk Substitutes has stimulated governments to design programmes for more energetic promotion of breast-feeding. Yet despite the increasing popularity of breast-feeding in the industrialized countries, no similar increase has occurred in developing countries. This may indicate that promotional efforts in developing countries may not be getting through to mothers or may not be designed to meet their specific needs (Kocturk and Zetterstrom, 1988).

Despite breast-feeding's benefits, it is associated with one major problem. Nearly all chemical compounds ingested by the mother will be found in her milk in one form or another. DDT, its derivatives, other pesticides, cadmium, lead and mercury have been found in human milk in several countries. Recent studies (Hofvander *et al.*, 1981; Slorach and Vax, 1983; Jensen, 1983 and Karakaya *et al.*, 1987), have revealed that the concentration of DDT and DDE in human milk in some countries is higher than the acceptable daily intake criteria and maximum residue limits established by WHO/FAO. However, no evidence has been found to suggest that the levels of DDT and DDE generally found in human milk have harmed infants.

In general, new-borns are particularly sensitive to toxic chemicals because their kidneys, liver, enzyme systems and blood-brain barriers are not fully developed. Furthermore, the new-born has very little body fat available for the storage of these chemicals; so the fat-soluble chemicals are circulated in the blood throughout the body for a longer period, and may interfere more intensely with normal enzyme activity.

But breast milk tends to be much less contaminated than substitutes. The common high death and disease rates among artificially fed infants in many developing countries stem from improper preparation as well as contamination of infant formulas and other foods. Feeding bottles and teats, unless washed carefully with clean, boiled water, can be easily contaminated with bacteria.

Poor and illiterate mothers may also undernourish their children by over-diluting the relatively expensive formula. Also, many mothers keep any unfinished portion of the solution for later use, perhaps topping it with additional new preparation. Without proper refrigeration, the solution can easily become contaminated (Oni, 1987).

Clearly, the above risks demand water-contamination be reduced in communities using infant formulas.

Weaning, diarrhoea and ORT

The diet which accompanies weaning in developing countries is often sadly inadequate in both quality and quantity, and may be especially low in protein, vitamins and essential minerals. Protein-calorie malnutrition is frequently seen in young, recently weaned children existing on a marginal diet; intestinal parasites may aggravate this situation.

In its milder form, this malnutrition seriously curbs growth. But often the child, already weak, succumbs to an infective illness. Poverty and poor environmental conditions aggravate the situation. Babies are constantly exposed to agents of infection in such environments, especially when they begin to crawl around and explore their surroundings. The tendency of infants to put anything which comes to hand in their mouths increases the risk of ingesting chemicals and polluted material encountered in and around the home.

The result is often a bout of diarrhoea. It is estimated that every year about four million children under five years of age die of diarrhoea in developing countries (UNICEF, 1990). In purely numerical terms, diarrhoeal diseases are the major cause of death among children. In all, an estimated 340 million children under five who live in developing countries (excluding China) suffer almost 1 billion diarrhoeal episodes a year – an average of three such attacks for every child. Repeated attacks of diarrhoea not only threaten children's lives, but tend to cause or aggravate malnutrition and thus stunt their physical and mental growth.

Diarrhoeal diseases are mostly the result of water-borne viral and bacterial infections. If not treated, acute diarrhoea may kill rapidly, mainly through dehydration. The problem is extremely serious in developing countries, particularly in rural areas and marginal settlements (slums, shanty towns, etc.) where the availability and accessibility of clean water are poor, storage facilities inadequate and sanitation appalling.

Poor environmental conditions in rural areas and in marginal settlements in developing countries are also behind the spread of other communicable diseases. Overcrowding in urban shanties or in rural houses, lack of heating, poor ventilation, air pollution, poor nutrition, lack of water for washing – all accelerate the spread of many of these diseases.

Many people in rural areas and marginal settlements in the developing countries still have no access to safe, clean water or sanitation services. The International Drinking Water Supply and Sanitation Decade (1981-1990), launched by the United Nations in 1980, aimed at providing everyone with clean water supplies and adequate sanitation facilities by 1990. During the period 1980-88, approximately 535 million people gained access to an adequate and safe water supply, and approximately 325 million gained access to appropriate sanitation (WHO, 1988). This leaves approximately 1,130 million without a satisfactory water supply and 1,750 million without appropriate sanitation.

The simple and inexpensive oral rehydration therapy (ORT) introduced by WHO in its Global Diarrhoeal Diseases Programme, which became operational in 1980, has been effective in the treatment of diarrhoea. Oral rehydration salts (ORS) are a mixture of salt and sugar in water which helps to transfer the water from the gut to the rest of the body, combating the dehydration that can be lethal in diarrhoea. Access to ORS has risen dramatically since 1980.

In 1985 about 18 per cent of children with diarrhoea were treated with ORT, which

includes both ORS and use of home-made fluids such as rice water, soups, fruit juices, etc. (Tulloch and Burton, 1987). By 1989 the percentage of these children reached 34 per cent (UNICEF, 1989), and this was estimated to be saving the lives of some 1 million children under the age of five each year.

Even if used on a large scale, ORT will never be a substitute for an improvement in the environmental factors that are at the root of the problem. Here, as elsewhere, prevention is better than cure.

Infants and chemicals

Infants and young children are particularly affected by chemicals ingested in water and food. Normal infants and young children have different structural and functional characteristics than older youths and adults. They have a larger surface area in relation to weight, different body composition, and higher metabolic and oxygen consumption rates (and hence greater intake of air per unit of body weight). Their entire bodies, and their organs and tissues, are growing rapidly, particularly during the first six months after birth.

Many organs and tissues are functionally immature at the time of birth, and they mature at different rates. Moreover, infants need more energy and fluids per unit of body weight than older children and adults. All these characteristics put them at greater risk from exposure to chemicals and other pollutants.

Nitrate in ground water, used both for domestic purposes and for drinking, has recently become a cause of concern in several countries as use of nitrate fertilizers and manure in agriculture rises (El-Hinnawi and Hashmi, 1987). Nitrate itself is not very toxic. But bacteria in the mouth and elsewhere can convert nitrate into nitrite, which can induce methaemoglobinaemia (a reduction in the oxygen-carrying capacity of the blood), especially in infants (NRC, 1978).

Most cases of methaemoglobinaemia can be traced to well-water containing high concentrations of nitrates used in the preparation of infant dried milk drinks. Most instances have been associated with water containing more than 90 milligrammes per litre (mg/l) of nitrate, but a few cases have been associated with water containing less than 50 mg/l (NRC, 1978; WHO, 1977).

Cases of methaemoglobinaemia in babies fed with spinach puree or carrot juice (both of which may contain very high levels of nitrates) have been reported, but there is little data to establish dose-response relationships (WHO, 1977). WHO has recommended that infant dried milk preparations should be prepared with low-nitrate water (at least below 45 mg/l) and that low-nitrate vegetables should be used in baby foods.

Nitrate can react with amines to form nitrosamines, many of which have been shown to be potent carcinogens in animals. Nitrosamines and nitrosatable compounds (i.e. compounds that can be transformed into nitroso compounds) have been found in children's pacifiers and baby-bottle teats due to certain vulcanization accelerators and latex stabilizers used in their manufacture. Despite recent regulations in North America and in some European countries limiting the content of these compounds in pacifiers and baby-bottle teats, items that exceed the limitations by a factor of more than 100 can be found on the international market (Westin *et al.*, 1987).

Malaria and other parasitic diseases

Malaria continues to be one of the most serious public health and environmental problems in much of the developing world. This disease is endemic in 102 countries, placing over half the world population at risk. Malaria strikes some 100 million times (WHO, 1987) and kills as many as 2 million people annually. In Africa, malaria infects about half

of all children under the age of three, killing an estimated 1 million each year (WHO, 1985). Malaria threatens a child not only with illness and death, but with poor growth, fitness and educational achievement.

Poor drainage of stagnant waters, ill-conceived irrigation schemes, and irrational use of pesticides all contribute to an increase in the population of mosquitoes that carry the malaria parasite. They also strengthen mosquitoes' resistance to insecticides. In 1989, researchers at the University of California reported that a total of 504 species have developed resistance to one or more pesticides, an increase of 90 species in the past decade (Georghiou, 1989). Environmental management techniques – ranging from appropriate water development (to avoid the creation of breeding areas for mosquitoes) to the surveillance and correction of existing schemes – must be used in combination with chemotherapy and chemical or biological control of mosquito populations. UNEP has been collaborating for 10 years with WHO and FAO in using the new techniques of Integrated Pest Management (IPM) in a large number of developing countries.

The incidence of several parasitic infections is decreasing in a number of developing countries that have succeeded in improving their social, economic and environmental situations. In Costa Rica, Cuba and Trinidad and Tobago, there has been a continuing and persistent decline in the incidence of malaria, hookworm and other helminthic infections (Ebrahim, 1985).

About 4 million of the 15 million children under five who die each year succumb to acute respiratory infections (ARI). More than 90 per cent of these deaths occur in developing countries. The following causes of death are considered as ARI-related deaths: tuberculosis, diphtheria, pertussis (whooping cough), measles, otitis media (inflammation of the middle ear), upper respiratory tract disease, other respiratory tract diseases, acute bronchitis and bronchiolitis, pneumonia, influenza and pleurisy (Leowski, 1986).

Growing evidence suggests that in developing countries, bacterial pathogens play a far greater role as a primary or secondary cause of severe low respiratory tract disease than in industrialized countries. Bacterial infection might be favoured by impairment of immunity in malnourished children, poor environmental conditions and the lack of appropriate health care.

Indoor pollution

Infants whose parents smoke suffer more than twice as many cases of pneumonia and bronchitis than do infants whose parents do not smoke. In the United States, it has been established that cigarette smoking is a risk factor for sudden infant death syndrome (SID), a mysterious ailment that kills one in every 400 babies born in the United States and other industrialized countries (Newland, 1981).

Infants and young children are also exposed to smoke from burning firewood and agricultural residues, especially in rural areas of developing countries. Many children in Lagos, Nigeria, develop bronchiolitis or bronchopneumonia as a result of extended exposure to smoke from burning firewood. Many children rest on their mothers' backs or laps while the mothers cook and tend the fire, exposing them to smoke from very early infancy.

In Papua New Guinea, children exposed to open fires have higher rates of impaired lung function and chronic respiratory symptoms, when compared to children elsewhere who were not exposed to such a polluted indoor environment (WHO, 1984; Smith, 1986).

Outdoor pollution

Infants and young children encounter various outdoor air pollutants, particularly in

urban areas near industrial centres. Children inhale more air per unit of body weight than do adults. At rest, the difference is about twofold for children younger than age three; as children grow older, the difference gradually decreases. Thus, per unit of body weight, young children inhale about twice as many pollutants than do adults.

Several studies have demonstrated the link between air pollution and the incidence of respiratory symptoms and pulmonary diseases in children (Colley and Brasser, 1980; Groupe Coopératif PAARC, 1982; Dassen *et al.*, 1986; Goren and Hellmann, 1988).

The effects are most obvious when air pollution is especially intense. In the London smog of 1952, the death rate for children under one year of age doubled (Norwood, 1980). From 16 to 21 January 1985, an air pollution episode occurred throughout Western Europe. Near Amsterdam, the 24-hour average total suspended particulates and sulphur dioxide concentrations were each in the range of 200-250 micrograms/m3. (The lower exposure limit for sulphur dioxide specified by WHO guidelines is an annual mean of 40-60 micrograms/m3.) During the air pollution incident, pulmonary functions in children were 3 to 5 per cent lower than normal. This dysfunction persisted for about 16 days after the episode (Dassen *et al.*, 1986).

Recent data by the WHO/UNEP GEMS/Air Programme for 54 cities over 1980-1984 indicate that only 27 had acceptable sulphur dioxide concentrations in their air. Eleven cities had marginal air quality, and the remaining 16 showed unacceptable air quality. Data on suspended particulate matter (SPM) show that 32 of the 54 cities had annual SPM averages consistently higher than the upper limit of the WHO guideline values (60-90 micrograms/m3); 13 cities had SPM averages within the WHO range, while only 9 cities had acceptable concentrations of SPM (below the lower exposure limit of WHO).

GEMS has estimated that some 990 million people – half the almost 2 billion living in urban areas in 1985 – live in areas with marginal or unacceptable levels of sulphur dioxide in the air (UNEP, 1989). About one fourth of those affected are children, who are more susceptible to the effects of air pollution than adults.

Although air quality has been improving in some cities of the industrialized countries, most cities in the developing world are becoming steadily more polluted. Uncontrolled increases in the number of vehicles, poor vehicle maintenance, industrial growth and the near-absence of air-quality regulations all play a role. In addition, the influx of poor people into urban slums can cause increased air pollution due to the greater use of charcoal, wood and paraffin for cooking and heating.

Lead in children

Children up to about six years old are most at risk from exposure to lead (WHO, 1977; NRC, 1979; Brunekreef, 1986). Compared to adults, children take in more lead from the air or with food per unit of body weight. Putting things in their mouth exposes them to lead in dust, dirt or foreign objects. Paint containing lead is the most concentrated source of lead in the child's environment. Those children with access to such paint are at great risk.

Engines run on petrol/gasoline are to blame for half the man-made lead pollution in the air (Caplun, 1984). Lead is added to gasoline in the form of tetra-ethyl lead compounds, but exhaust gases contain predominantly inorganic lead aerosol. The concentration of lead in urban air ranges generally from 0.5 to 5 micrograms/m3, depending on the density of automobile traffic (Bennett, 1981). In suburban and rural areas, the lead concentration is generally less than 0.5 microgramme/m3. A European Economic Community (EEC) directive adopted in 1982 laid

down the figure of 2 micrograms/m3 as a maximum annual mean concentration. Blood lead levels are falling in those countries that have made lead-free gasoline readily available.

Children who live in an urban environment, even if they do not have access to lead-based paint, and do not habitually put things in their mouths, can be expected to inhale and ingest approximately 160 micrograms of lead every day (Boeckx, 1986). Of this amount, approximately 75 micrograms will be absorbed into the body and then distributed to all tissues. Concentrations in the blood and soft tissues fluctuate rapidly according to uptake and excretion rates. But lead is only slowly exchanged between these tissues and the bones, where the metal's half-life is 10 years or more.

The work of UNEP has indicated that most people with normal background exposures to the metal have a blood lead level of 100-200 micrograms per litre (micrograms/l) (Bennett, 1981). In some cities – Stockholm, for example – values below 100 micrograms/l are encountered (Friberg and Vahter, 1983). In other cities, such as Mexico City, levels reach 230 micrograms/l, and, in Bangkok, 340 micrograms/l. In the United States, the mean blood lead concentration is about 140 micrograms/l, but a study in Baltimore showed that 90 per cent of a group of 333 inner-city infants had blood lead concentrations in excess of 300 micrograms/l. About 26 per cent had blood lead concentrations in excess of 600 micrograms/l (Boeckx, 1986).

Available data (WHO, 1977, 1980) show that haematological effects occur in children at blood lead concentration of about 200 micrograms/l. The earliest peripheral nervous effects begin to occur in the blood lead range of 400-500 micrograms/l (in a few individuals, they may occur below 400 micrograms/l). Effects include seizures, behavioural changes, mental retardation, irritability, lack of co-ordination and clumsiness.

Recently, concern has focused on effects of lead which do not show up in a doctor's examination, particularly effects related to intelligence and behaviour. These have been found at blood lead concentrations below those usually associated with clinical symptoms. Though numerous reports propose correlations between blood lead concentration and decreased intelligence quotient (IQ), hyperactivity and mental retardation, no conclusive evidence has been offered. A recent study on the long-term effects of exposure to low doses of lead in childhood indicated that such exposure is associated with deficits in central nervous system functioning that persist into young adulthood.

In the United States, an upper limit of blood lead concentration of 250 micrograms/l in children has been accepted (Boeckx, 1986). WHO has recommended that the blood lead level of women of reproductive age should not exceed 300 micrograms/l (WHO, 1980).

Food sold in the open air along city streets has been found to contain high levels of lead. An FAO study in Indonesia found lead contamination in hot dogs and other dishes sold by street vendors. The food had been displayed on tables exposed to road dust containing lead from vehicle exhaust fumes. A traditional dish of steamed rice and coconut milk was found to contain the highest lead contamination, at 0.46 ppm.

Current legislative actions, especially in industrialized countries, have restricted the content of lead in gasoline. The maximum permitted lead content of gasoline ranges from 0.15 grammes per litre (g/l) in the Federal Republic of Germany, the Netherlands and the United Kingdom to a maximum of 0.4 g/l in Denmark, France and Italy. A further decline in the use of leaded

gasoline is expected as more cars are equipped with catalysts which require lead-free fuel.

As the use of leaded gasoline has declined, some cities have experienced marked reductions in the lead concentration in the air. For example, lead concentration decreased from 2.8 microgrammes/m3 to 1.5 microgrammes/m3 in New York City (El-Hinnawi and Hashmi, 1987). In contrast, airborne lead is rising in developing countries' urban centres as a result of increased traffic and the non-restricted use of leaded gasoline.

Cadmium

Cadmium, a heavy metal which is causing growing concern, usually enters the body with food. But cigarette smoking can be an equally important source. Children from areas contaminated with cadmium may ingest it in dust or soil.

The average daily intake of cadmium in the European Community (in nations for which data is available) varies from 20 to 60 microgrammes per person per day. The body retains between 1 and 9 microgrammes. As little as 5-6 microgrammes of cadmium retained daily over a 50-year period will result in renal tubular dysfunction in about 1 per cent of the population (Hutton, 1982).

In contaminated areas, the dangers are far greater. In the late 1940s, thousands of Japanese succumbed to 'Itai-Itai' disease after eating rice grown in paddies irrigated with cadmium-contaminated river water. The disorder revealed itself in bone defects and severe kidney damage.

Cadmium crosses the placenta, although the placenta does provide a partial barrier against the metal. So levels in the foetus are generally slightly less than in the mother's blood. Small amounts of around 0.01 ppm are present in breast milk, giving the average baby a weekly intake of about 0.04-0.1 mg of cadmium. WHO recommends a maximum weekly intake of 400-500 microgrammes for adults (Yost and Miles, 1979).

3. Older children and the environment

Growing children have the same basic needs as adults. But for children, the needs are more pressing – depriving them of these necessities is more damaging. How much more disturbing, then, that a large proportion of the world's children are growing up in circumstances of extreme poverty. Life offers hunger, illness, illiteracy, unemployment and lack of opportunities.

Many of them, if they survive the vulnerable period of childhood, will become driftwood on the social and economic currents of their countries. There is a fundamental principle in planning for children's futures: The earlier that measures are introduced to meet children's needs, the less is the cost, the greater the effectiveness and the greater the benefit both to the child and to society.

Poor housing, air pollution, and the lack of clean drinking water and appropriate sanitation are behind the spread of various diseases among older children. Children between 6 and 14 years old are more vulnerable to some diseases than younger children because they go outside more and are more exposed to air and water pollution as well as dirt in streets and playgrounds.

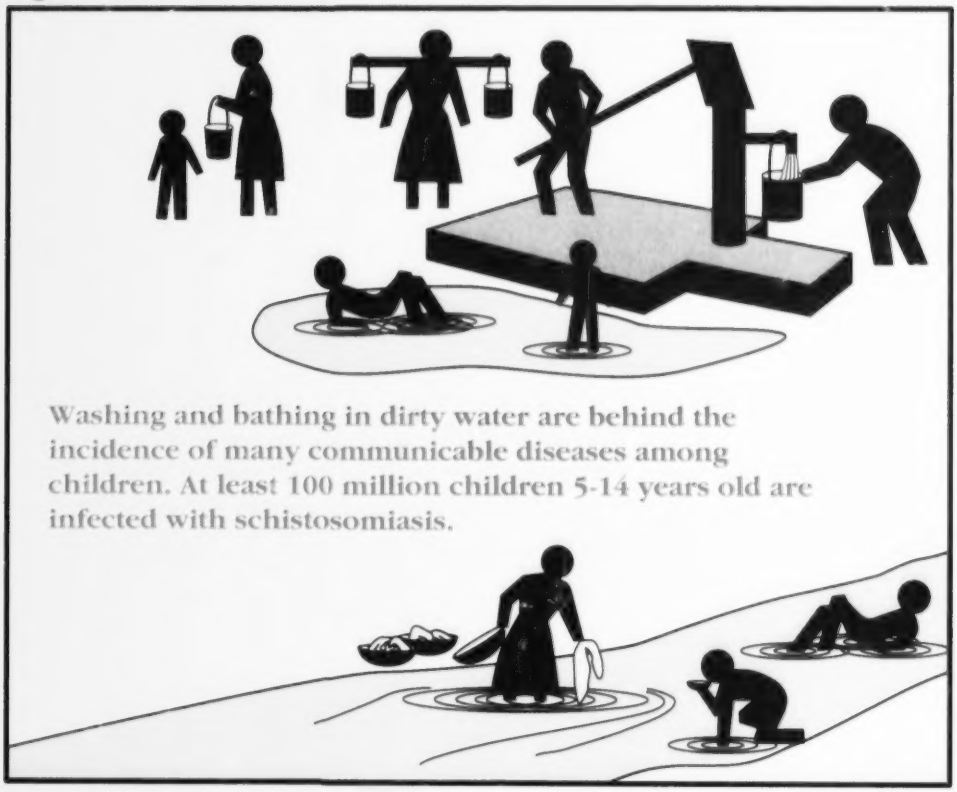
The disease schistosomiasis, caused by a water-borne parasite transmitted by snails, is a good example of an environmental danger to older children. The disease in-

THE YEAR 2025 – A CHILD'S VIEW

It is a typical day in my home city.... The dust and soot particles in the air have clouded away the sun's brilliant rays. Our days are bright but never sunny. But I'm not complaining. I think that man is a wonderful creature for he can adapt himself marvellously for any kind of living. Perhaps that is why we survive, for our air is filled with what our ancestors called 'pollutants'. Today these poisons have become an accepted feature of our lives. Nearing the entrance to my city, I slip on my oxygen mask – for it is dangerous to go into the heart of the city without one. Every day, the papers are filled with reports of tragic deaths resulting from poisoning. So I join the crowd – the host of masked monsters whose pained faces lie hidden under the cold, ugly piece of plastic....

Veena Hari, 'My Home City, One of Hundreds of Cities in the World', from an unpublished essay.

Figure 7:


Washing and bathing in dirty water are behind the incidence of many communicable diseases among children. At least 100 million children 5-14 years old are infected with schistosomiasis.

Source: El-Hinnawi, E. (1990) personal communication

HEALTH, NUTRITION AND THE ENVIRONMENT

Young schoolchildren in Mauritania are learning about their natural surroundings in a carefully co-ordinated programme which encourages them to focus on their own health and nutrition.

Children in their first four years of schooling each receive a large booklet of 70 to 80 illustrations, printed on extremely tough, waterproof, virtually child-proof paper. The illustrations are designed to grab and hold the children's attention, with portrayals of animals and plants and other aspects of the Mauritanian environment. They feature elements of the students' own personal environment in the home and village. These, along with a carefully planned teacher training guide, lead to discussions of human survival as well as animal survival. Teachers introduce good eating and sanitation habits in ways designed to interest the students.

The programme, designed by the Agence de coopération culturelle et technique (ACCT) and supported by UNICEF and the Canadian Government, has been running since 1984.

It is structured, according to ACCT, to help Mauritanian children analyse the realities of their situation at an early age. They learn what is good for their health and well-being, while developing practical insights into and an appreciation of the natural environment and ecological conditions.

***Source*: UNICEF.**

fects an estimated 200 million people, and endangers another 600 million in 74 subtropical and tropical countries in Asia, Africa, the Caribbean and Latin America. Half the infected are in Africa. The peak prevalence and intensity of infection is among children 10-14 years of age (WHO, 1984). These children tend to wash and bathe in canal or pond water infested with the parasite, because their families lack clean water.

Older children and food

Malnutrition is widespread among children 6-14 years old, especially in developing countries. About 40 per cent of children in developing countries (excluding China) are thought to be underweight. Some 60 per cent of these children live in South-East Asia, 14 per cent in Africa, and 13 per cent in the Eastern Mediterranean region (Haaga *et al.*, 1985). Anaemia plagues 46 per cent of children 5-12 years old in developing countries, compared to only 7 per cent in industrialized countries (DeMaeyer and Adiels-Tegman, 1985).

Some countries have attempted to improve children's nutritional status by food supplementation programmes. Some school-based programmes have been relatively successful; others have failed to achieve their goals. Cost-effective food supplementation programmes ensure that the supplement, be it in the form of food, food tokens or money, reaches the target population, and only the target population, rather than wealthier families.

New developments could make the future nutritional status of children worse. Commercial products are taking the place of traditional food, and the associated advertis-

ing campaigns and pressure for 'modernization' are changing eating habits for the worse in many areas. Already poor diets are becoming even poorer.

The unnecessary but popular 'junk' foods threaten more than poor nutrition. Many of these, especially sweets, are manufactured by small, unregulated industries, or at home, and are marketed on street corners near kindergartens and schools. Some of these products are contaminated; others contain various unlicenced colouring agents and additives which laboratory tests have shown to cause cancers in animals. Children, more ignorant than adults of the risks involved, frequently eat unwashed fruits and vegetables and drink various juices and sodas unthinkingly. They may eat cooked food from street stands or roving cars.

Hazardous environments

Children are less able than adults to recognize hazardous environments and negotiate risks. Thus, greater hazards at home and outdoors mean a higher rate of accidents for children in developing countries, than in the industrialized world. This high accident rate, combined with the greater difficulty in obtaining good medical treatment, makes accident mortality higher in developing countries.

Accident mortality rates from all accidents for boys aged 5-14 were 20 per 100,000 population in developing countries and 17 per 100,000 in industrialized countries. For girls of the same age, the accident mortality rates were 11.3 and 8.0 per 100,000, respectively (Taket, 1986). Boys suffer more because they tend to be more active and violent than girls, and are thus exposed to more risks. A study in the United States showed that fatal accidents at home are more frequent in young children (0-4 years), while fatal accidental injuries in older children (5-14 years) are more frequent outside homes (Halperin *et al.*, 1983).

TRAFFIC POLLUTION – A CHILD'S VIEW

The roads make their way like poisonous serpents through the Swedish landscape. Nature was spoiled when the roads were built and now the cars vomit their poisonous air pollution. If you are observant, you can see that the trees at the roadside are grey-green. The firs and pines grow thinner and the leafy trees lose their leaves....If cars reduced their speed, used petrol without lead, and more effective methods were created for air purification, Nature would feel better.

Cecilia Brundell and Charlotte Goransson, Morby, Sweden, from *Children Think Green* (1988). UNEP, Nairobi.

For every accidental death there are several hundred accidental injuries, most of them slight, some of them severe and likely to leave permanent after-effects. Available surveys show that one child in every five or 10 sustains an accident each year (Manciaux and Romer, 1986).

Lack of safe playground space raises accident rates in cities in developing countries. In these circumstances, frustrated children may resort to playing in the streets or on building sites, exposing themselves to various hazards. Recently there has been growing concern over contamination of some of the areas set aside for children's play by *Salmonella* bacteria, which may trigger the human disease salmonellosis (Haddock *et al.*, 1986; Haddock and Nocon, 1986).

Education

Appropriate education can give children the tools to break out of an existence which is perhaps both economically and environmentally marginalized. It can also be a powerful force for giving children sound environmental values. Yet the older children grow, the less education they tend to receive. In low-income countries, only 52 per cent of boys and 39 per cent of girls go to primary school, and only 18 per cent of boys and 8 per cent of girls to secondary school (UNICEF, 1989).

In developing countries, at least 100 million children aged 7 to 10 are not learning to read, write or handle simple numbers. In contrast, almost all children – boys and girls – in some medium-income countries and in industrialized countries go to primary school. In the latter countries, 83 per cent of boys and 82 per cent of girls receive secondary education. Such figures aside, several studies indicate clearly that the environment of the child has a significant effect on his or her ability to learn.

The proportion of girls attending primary school in developing countries varies from as little as 10 per cent in some countries to as high as 99 per cent in Sri Lanka, 93 per cent in Botswana and 91 per cent in China.

However, more girls than boys drop out – often because they must participate in household chores such as fetching wood and water – and their share in secondary education is rather low in most developing countries. This is particularly the case in societies governed by certain traditional beliefs and customs.

This sex discrimination is not restricted to education. It sometimes extends to treatment of female infants. In some regions, such discrimination results in less adequate nutrition and health care for girls, and consequently higher rates of disease and death. The evidence for such sex discrimination is clearest for countries in Southern and Western Asia and North Africa. The association between sex discrimination and higher mortality rates for girls has been encountered in countries and areas such as Algeria, Bangladesh, Egypt, north-west India and Pakistan (Waldron, 1987).

Smoking and drugs

Smoking is an epidemic growing at 2.1 per cent per year (Chandler, 1986) with children playing their part in this growth. In 63 countries, total cigarette use increased between 1975 and 1985. However, in a few countries tobacco smoking dropped. In the United Kingdom, the percentage of males who smoked dropped by more than 25 per cent; in the Netherlands and the United States, male smoking fell by more than a third. In Zimbabwe, the reduction was 35 per cent.

Smoking prevalence among young people is changing, generally for the worse. Most children start smoking because their parents were smokers or because their companions smoke:

- In the United Kingdom, 6.9 per cent of boys and 2.6 per cent of girls aged 10-11 are regular smokers.
- In Belgium, the percentage of smokers rises from 11 per cent at age 11 to 50 per cent at age 15.
- In France, 30 per cent of those aged 10-17 years are habitual smokers.
- In the Federal Republic of Germany, 36 per cent of those between 10 and 12 are regular smokers.
- In Italy, 60 per cent of boys smoke by the age of 15.

The percentage of children who smoke in developing countries varies from one country to another, being generally higher in urban than in rural areas.

Tobacco smoking appears to be associated in some countries with increasing drug use. Cannabis is the most widely used drug in the world. Young urban and semi-urban smokers are at particular risk. Recent analysis of the frequency and severity of drug abuse and drug dependence reveals an upward trend in most countries (WHO, 1987).

It has been estimated that there are about 48 million drug users in the world, a large proportion of whom are children aged 10-15. Amphetamines, barbiturates, sedatives and tranquillizers are consumed in most countries, and their use is increasing throughout the world as they become more available on both the legal and the illicit market. The sniffing or inhaling of volatile material (glue, solvents, etc.) is also spreading in a number of countries, particularly among the young urban populations.

4. Children at work ... children in distress

Since the beginnings of farming, children have worked in agriculture. They continue to do so today – hoeing, seeding, weeding, spreading fertilizers and pesticides, harvesting, threshing – and then bringing their crops to market. Girls may labour at home, fetching water, cleaning, cooking, feeding domestic animals, milking, cleaning out stables and processing dung cakes for fuel. Even small children gather firewood and crop residues for home use.

Parents who do not need their children's labour may hire them out to neighbouring farmers, for work in nearby plots. In this way, children often contribute to the family income. To the very poor, this type of child labour is not seen as exploitative, but as an economic fact of life or even a benign influence on children because it teaches them responsibility at an early age.

The work is back-breaking. Children – some as young as six – labour for long hours for half or one third the adult wage. Most work barefoot in the fields, exposed to parasites and communicable diseases. They are undernourished, making them particularly vulnerable to the effects of pesticides.

Many rural areas have more children than they can support. So parents send their children to work in households in nearby towns, for agreed monthly wages. Where land degradation and desertification have destroyed arable land migration may be the only option.

Migration in search of livelihood is not a recent phenomenon. It is the traditional route for rural peoples seeking better lives, for themselves and their families. Initially, such migration may represent a short-term adjustment to a limited period of scarcity. In this case, men may migrate temporarily, leaving their wives and children behind. But when the land has deteriorated drastically and can no longer feed the household, many leave their homes forever.

Some of these environmental refugees eke out an acceptable existence for themselves, and gain a foothold for their children. But the majority end up amid the urban unemployed, swelling the ranks of the homeless or poorly housed. Squatter settlements and shanty towns proliferate, becoming a common sight on the edge of most cities in developing countries.

In these overcrowded settlements, people lack almost all basic facilities. They use open, untested water for washing, cleaning and waste disposal. Makeshift shelters

are their homes, surrounded by accumulating domestic waste. With old slums overflowing, more and more migrants become squatters on vacant land or buy illegally subdivided plots to build their own dwellings – anything from tar-paper shanties to sturdy, sound structures.

The most disadvantaged end up on dangerous ground – steep hillsides or flood zones – where natural hazards join overcrowding and poor sanitation to jeopardize their health. Often slums and squatter areas spring up next to potentially dangerous industrial installations. Accidents such as the massive explosion of the liquefied petroleum gas storage facility near Mexico City in 1984, and that at Bhopal, India, that same year, devastated nearby slums and their hard-pressed residents.

Children at work

Hundreds of millions of children grow up in these nests of squalor, misery and alienation. Millions drop out early from school – if they attend school at all. Driven by low family incomes, many start working at a very young age, labouring for pennies in households, workshops, grocery shops or small industries.

The International Labour Organisation (ILO) estimated that the overall number of children under 15 who were 'economically active' at the beginning of the 1980s was around 50 million; other estimates give figures of 75 to 100 million (WHO, 1987b). Virtually all economically active children (98 per cent) are found in the developing countries. The percentage of these children varies from one country to another. From 1980-1984, 52 per cent of children (10-14 years) in Bangladesh were economically active; in Indonesia, 11 per cent; in Pakistan, 20 per cent; in Egypt, 6.5 per cent; and in Singapore, 0.9 per cent.

Child employment is quite different from adult employment. Employed children are vulnerable and can be readily exploited. They are exposed to risks at work; they are more vulnerable than adults to the effects of various pollutants encountered in the work environment.

Children working in battery workshops or small printing shops are exposed to high levels of lead. Those working in metal workshops are exposed to high concentrations of toxic vapours and corrosive liquids. Children working as garbage collectors are exposed to a wide array of infections.

The 1989 Convention on the Rights of the Child states that the child should be "protected from economic exploitation and from performing any work that is likely to

INDUSTRIAL POLLUTION – A CHILD'S VIEW

One of the most serious environmental problems here is industrial pollution. It results in contamination of both air and water. However, decisions about new factories are made by politicians, not scientists. In existing factories purification devices and treatment plants are very expensive and are seldom used to reach a satisfactory level of purity. Therefore, fighting industrial pollution seems hopeless. What can be done? We could at least control air pollution by establishing a small garden to help balance the air. Perhaps we could help by improving our motors for cars, trucks and buses.

Krzysztof Marek Langer, Warsaw, Poland, from *Children Think Green* (1988). UNEP, Nairobi.

Figure 8:

Habitat

Life in the slums

There are many characteristics common to life in these marginal urban areas

Roots
Most slum and shanty-town dwellers are of rural origin. The majority of migrants are driven to town by poverty and start their urban life in the worst areas.

Youth
The average age of slum inhabitants is very low. Large families are traditional in the countryside, and people continue to have them.

Overcrowding
Population density is the highest in the world. It is common to find a family of 10 members sharing one room.

Women householders
In many slums women – abandoned or divorced – are the only providers for 50% of the households.

Squalor
Overcrowding and lack of drainage and sanitary systems create conditions hazardous to health. Rubbish piles up in the street and is not removed.

No services
In these conditions, the need for water and sanitary disposal services is acute. Most slum households must fetch their water from a standpipe and deposit their waste in open drains. The rate of infection is therefore high; there is a constant risk of epidemic.

Malnutrition
Slum dwellers are dependent for their food entirely on cash. As incomes are very low, children are malnourished.

Premature adulthood
Most mothers earn, and are absent from home. Children fend for themselves, in the care of older ones. Many are abandoned, or leave home, at an early age.

Source: El-Hinnawi, E. (1990) modified after *UNICEF News*, Issue 115 (1983) p.11

be hazardous or to interfere with the child's education, or be harmful to the child's health or physical, mental, spiritual, moral or social development". The Convention also calls for each State to introduce minimum ages for admissions to employment as well as appropriate regulation of the norms and conditions of employment.

The 1973 ILO Minimum Age Convention (No.138) prohibits all employment under age 12, and any work which "prejudices the schooling and development of children under 15". Only 28 countries have ratified the Convention, although many others have passed similar laws of their own. These laws – although humane and reasonable – often go unenforced (Moorehead, 1989).

Developing countries which have not ratified the ILO Convention cite prohibitive social and economic conditions. The sad truth remains that millions of families depend on their children's earnings for survival. The only way to eliminate child labour is to eliminate poverty.

Street children

This report can cover only a few aspects of the many problems raised by urban development, particularly in developing countries. The rise of the super-city poses massive environmental and social problems for their inhabitants, particularly children. By early next century, 60 per cent of all people could be living in cities.

Many children who do not find work end up on the streets. Some 100 million children live on the streets of the world's cities today (Robilant, 1989). They live adrift on the margins of adult society – scavenging, stealing and finding transient jobs, selling small items, shining shoes, guarding and washing cars, etc. Gangs, prostitution and the drug trade are the inevitable fate for many.

Victims of poverty and underdevelopment, street children are also victims of poor environmental conditions. They are society's disposable people with no voice or vote; their plight is often overlooked by political leaders and city planners alike.

Children at war

Warfare also takes its toll of children's lives and welfare. Studies of wars in this century have shown that the development of weapons and military technologies have tended to increase civilian suffering. Of the 127 wars (including civil wars) between 1945 and 1989, all but two have occurred in the developing world. These have caused a total of 21.8 million war-related deaths, and the death toll among civilians has steadily increased. In the early 1950s, civilians accounted for half the war dead; in the late 1980s, civilians were about three quarters of the total dead (Sivard, 1989). Children, unable to protect themselves or flee effectively, are most at risk.

Wars obviously kill children, destroy environmental resources and wreck schools, homes and farms, but they also disrupt natural resource management programmes and programmes to improve children's well-being, such as feeding or immunization projects. It is perhaps a sign of progress that both sides in El Salvador's civil war agreed to 15 separate annual 'days of tranquillity' over the past five years, during which children were immunized. Both sides in Sudan's civil war agreed to 'corridors of tranquillity' to allow food and other supplies, including immunization equipment, to reach 2.25 million civilian victims of the conflict (UNICEF, 1990).

The issue of children being forced to fight in armed conflicts was discussed in great depth during the drafting and adoption of the Convention on the Rights of the Child, with much of the focus on the age limit for participation. The result of the negotiations was agreement that States parties to the Convention "shall take all feasible measures to ensure that persons who have not attained the age of 15 years do not take a direct part in hostilities". This confirms the age limit set in the Geneva Convention of 1949 and its protocols. Several governments had wanted the age to be raised. The debate brought the phenomenon of child soldiers to the attention of many groups and created strong movements to prevent and condemn the use of children as soldiers.

5. The environment and implications for future generations

The 1980s have seen the emergence of deep and growing concern over many environmental challenges – global warming, ozone depletion, tropical deforestation, loss of genetic resources, desertification and general land degradation.

These challenges are inextricably linked one to another. Climate change may increase

desertification and forest loss, as ecosystems change. Land degradation and forest loss may play a role in changing climates.

These syndromes will affect people of all ages. But their impacts on human life will increase over time. They are, therefore, this generation's legacy to its descendants. They threaten both developing and industrialized nations, but strike hardest at the poorest people in the poorest nations – those most directly dependent on environmental resources.

Global warming will exacerbate that trend. The Commonwealth Secretariat recently concluded that climate change poses the gravest dangers to the poor in the developing world, for two reasons: "In general, poor countries, and poorer groups within countries, have less capacity to adjust. Poor countries are also, in general, more vulnerable since their economies are more dependent on agriculture and natural resources" (Commonwealth Secretariat, 1989). The poorest groups in the poorest nations – those with the very least capacity to adjust – are children.

The joint ICSU/UNEP/WMO conference, held in 1985 at Villach, Austria, noted in its conclusions that many economic and social decisions – on issues such as irrigation and hydro-power, drought relief, agricultural land use, coastal engineering projects and energy planning – are being made on the assumption that past climatic data are a reliable guide to the future. "This is no longer a good assumption since the increasing greenhouse gases are expected to cause a significant warming of the global climate in the next century", the conference concluded (ICSU/UNEP/WMO, 1986).

Many health projects also rest on cosy assumptions. "Human health could be affected by even quite small changes in average mean temperature, and there is the prospect of some major diseases flourishing in warmer conditions and of more resistant strains of infection emerging" (Commonwealth Secretariat, 1989).

Present strategies for immunization, coping with disease vectors, providing safe drinking water, and improving nutrition are all based on climates, ecosystems, sea levels and solar radiation levels that exist today. These are all expected to change.

How much they will change cannot be well predicted. It is, therefore, virtually impossible to adjust health and nutritional strategies to take account of future climates. Climate changes may make some parts of the world wetter and some drier. Droughts could be more frequent and prolonged in some regions, while floods may ravage once floodless lands.

The scientific community does agree on one point. The increase in atmospheric concentrations of greenhouse gases such as carbon dioxide, methane, nitrous oxide, chlorofluorocarbons (CFCs) and ozone in the lower atmosphere and water vapour will lead to noticeably higher surface temperatures within decades, not centuries.

A doubling of pre-industrial atmospheric CO_2 concentration is expected to raise the global mean equilibrium surface temperature by an average 3°C. over the next 40 to 60 years. The increases are expected to be higher with increasing distance from the Equator. Summers may become drier in the middle of continents in the mid-latitudes of the northern hemisphere (UNEP, 1989b).

This temperature increase should result in a global mean sea-level rise of about 30 cm over the next 40 years or so. This would cause increased flooding in low-lying areas, many of which are densely populated. The magnitude of such greenhouse-driven flooding is not yet agreed upon by scientists. But a sea-level rise of about one or two metres would permanently submerge many wetlands and lowlands, accelerate coastal erosion,

exacerbate coastal flooding, threaten coastal structures and increase the salinity of estuaries and coastal aquifers.

Many coastal ecosystems which serve as breeding grounds and nurseries for fish and other marine resources will be radically altered. Such a sea-level rise could also cause higher tides and storm surges with the consequent extra damage to homes, buildings and land, and increased loss of life. These changes would have far-reaching environmental, economic and social implications for many countries. Several developing nations, particularly low-lying islands and archipelagos, are especially vulnerable.

The depletion of ozone in the upper atmosphere (stratosphere) is another global environmental problem arising from human activity. Emissions of CFCs and other ozone-depleting gases like halons, carbon tetrachloride and methyl chloroform are responsible for degrading the Earth's protective layer of stratospheric ozone. Most of these gases are also greenhouse gases.

Declining levels of stratospheric ozone allow more ultraviolet radiation to reach the Earth's surface, increasing the risks of skin cancer and cataracts and possibly degrading the human immune system. Additional radiation could also increase the incidence of certain diseases in livestock, decrease crop and timber yields and damage the base of the marine food chain.

The global or 'transboundary' nature of these threats is often stressed. But their 'transgenerational' aspect is less often discussed. Many of the expected effects will last for generations to come. And many of the gases which cause the problems will remain in the atmosphere for decades. CFCs released today may still be destroying stratospheric ozone molecules when our great-grandchildren inhabit the Earth. Average 'resident time' in the atmosphere for these polluting gases are as follows: carbon dioxide, 100 years; nitrous oxide, 170 years; CFCs, 60-100 years; and methane, 10 years (Graedel and Crutzen, 1989).

In a highly populated world in which all human endeavours are based on the present climate, almost any variation will be harmful over the short run. "Any change in climate is likely to induce an increased stress in society", according to the World Meteorological Organization. "This can be due to changes in agricultural practices, in the availability of water, or in greater variability in experienced weather with higher frequencies of storms and other experienced weather events" (WMO, 1987).

The health effects

Changes in climate and sea-level may not be the only cause for concern. Climate change and ozone depletion may radically alter disease patterns, in dangerous and unpredictable ways. First, increased amounts of ultraviolet radiation have been shown to decrease animals' immune response to various infectious agents (UNEP, 1989, 1989c). There is as yet no epidemiological data to suggest that such effects occur in humans, but it is likely that such data would emerge – if at all – only after the ozone layer had been depleted and radiation had increased.

Theoretically, the possibility exists that this syndrome could make the sort of immunization programmes which have saved millions of children's lives more dangerous, if not counter-productive. Vaccinations essentially involve giving an individual a mild form of the disease to be protected against. Vaccinating an individual whose immune response has been lowered due to exposure to ultraviolet radiation could actually make that person more, rather than less susceptible to the disease (UNEP, 1989, 1989c).

We need further research to learn which diseases may be rendered more infectious by increased ultraviolet exposure, to identify

the mechanisms by which this radiation affects the immune system, and to determine the impact of this immune suppression syndrome on vaccination efficacy.

Second, humans can adapt to moderate changes in and extremes in temperature. But this adaptive capacity is very low in infants; it rises through childhood and adolescence to a maximum which extends to about 30 years of age (Weihe, 1979). Currently, the temperature in Washington, D.C. exceeds 38°C. on an average of only one day per year; it rises above 32°C. about 35 days every year. "But by the middle of the next century, these figures could rise to 12 and 85 days respectively per year", according to the World Meteorological Organization. "The effect of such temperature rises on human health in Washington and similar cities throughout the world is difficult to predict. But there is no question that increased urban heat stress could come to claim many lives" (WMO, 1987). Infants are particularly at risk.

Changing disease patterns

A changing climate would alter the ecosystems of the agents which carry or cause many diseases, whether these be viruses, bacteria, parasites, plants, insects or other animals. As the climate warms, the boundaries of the tropics may extend into the present subtropics, and parts of temperate areas may become subtropical. As air temperatures increase, some diseases will become common in regions which once rarely knew them. Death rates may also climb significantly (Kalkstein *et al.*, 1986).

Bacterial, viral and parasitic diseases which flourish in tropical temperatures, such as those caused by the tetanus bacterium, will spread.

It can be assumed that with greenhouse warming, summer diseases will increase, while diseases associated with winter will decrease (de Sylva, 1988). Hepatitis B, epidemic cerebral meningitis, poliomyelitis, cholera, bacillary dysentery – all these diseases flourish in hot, humid weather. Children are the most vulnerable to all these diseases.

A warm climate may be more favourable for the propagation of airborne and water-borne communicable diseases. In areas where such diseases occur, children suffer the highest death rates (de Sylva, 1988).

Climatic change may affect diseases borne by vectors (mosquitoes, parasites, etc.) in two ways. First, changes in temperature, rainfall, humidity and storm patterns will directly affect the vector's reproduction rate, biting rate, and the amount of time of human exposure. Second, climate may change agricultural systems or plant species, thus changing the relationship between parasite, vector and host. Changes in agriculture could include such things as increased irrigation and increased use of pesticides to cope with new or greater numbers of pests.

Malarial parasites' development rates increase with warmer temperatures, but malarial mosquitoes will need wet areas in which to breed. In a warmer climate, mosquitoes also may move vertically, up into highlands which were once too cold for them. This may be particularly hazardous in tropical highland areas such as those in Ethiopia and Kenya, where there is no natural resistance to malaria.

The snail-borne disease schistosomiasis may increase if global warming forces greater irrigation or causes people to migrate towards irrigation projects. Changed human migration patterns, along with increased temperature and rainfall, may expand the geographic range of hookworms.

In the oceans, toxic red tides – which kill off marine life due to the proliferation of dinoflagellates – may increase as temperatures rise and nutrients from agricultural fertilizers leach into rivers and coastal waters

(Anderson *et al.*, 1985). This proliferation will disrupt marine food stocks and raise incidences of the disease ciguatera. This tropical human disease is caused by eating tropical fish which in turn have eaten organisms that have ingested dinoflagellates.

Both the rise in sea-level and increased ultraviolet radiation may disrupt marine habitats and aquatic food chains. Since fish constitute 40 per cent of all animal protein consumed by the people of Asia, such a disruption of the marine ecosystem would affect the food supplies of many millions of people and dramatically increase protein malnutrition in children. Food supplies may be further affected by an increase in livestock cancers and damage to some crops from radiation.

Water and waste

Water supplies, too, may be adversely affected by rising sea-levels: as the oceans advance inland, salt water will contaminate fresh water. Aquifers that provide water for domestic, agricultural and industrial purposes will be affected (Hull *et al.*, 1986).

Hazardous waste dumps are a current problem, but may become more threatening as the seas rise. The World Commission on Environment and Development estimated the global production of hazardous wastes at up to 375 million tonnes a year (WCED, 1987).

Recently, companies in the industrialized nations have coped with these large amounts of hazardous wastes by exporting them to developing countries, few of which have the technology to deal with them.

Metal drums containing such wastes could be damaged as rising seas and corrosive salt water encroach on the coastal waste sites (Flynn *et al.*, 1984). Reportedly, 1,100 active hazardous waste disposal sites lie within floodplains in the United States alone. There have already been several environmental disasters caused by flooding (Commonwealth Secretariat, 1989).

Sea-level rise could also spread infectious disease by flooding sewerage and sanitation systems in coastal cities, and increase incidences of diarrhoea in children. The flooding of hazardous waste dumps and sanitation systems could lead to long-term contamination of crop lands.

Global warming may also mean the loss of millions of children's homes. Rising seas are expected to flood some of the planet's most populated regions. Sea water will probably flood large portions of Bangladesh, Egypt and the Netherlands (UNEP, 1989; UNICEF, 1989b). In all, about half of humanity lives in coastal regions.

Children are always most vulnerable in catastrophes. So, as different areas are struck by increased flooding, more frequent and severe droughts, and more frequent and severe tropical cyclones (de Sylva, 1988), children will make up the lion's share of victims. During the three-year drought in Africa in the early 1980s, 150 million people were affected, three quarters of them women and children (UNICEF, 1985).

The forests

At present, tropical deforestation is caused largely by the clearing of forests for agriculture and the over-exploitation of forests by both timber companies and governments. This precious resource is being rapidly squandered by mismanagement or no management at all. A recent survey undertaken for the International Tropical Timber Organization (ITTO) found that far less than 1 hectare out of every 800 hectares of productive tropical moist forest in ITTO producer countries was being managed for sustainable production (Poore, 1989). Climate change is expected to accelerate tropical deforestation.

At the start of the century, there were 1.5 to 1.6 billion hectares of tropical forests on the planet. Today, there are only 900 million. Every year, between 7.6 million and 10 million hectares – an area the size of

CHILDREN BENEFIT FROM THE RAIN FORESTS

In 1982, Guillermo Arevalo, a shaman or traditional medicine man of the Shipibo-Conibo tribe in the Amazonian region of south-eastern Peru, decided to revive tribal traditions of indi[illegible]ous medicines. He wanted to make these medicines a part of the national health programme. Arevalo started training native young people to identify and use herbs to treat such common health problems as intestinal parasites, diarrhoea and dehydration. Within two years more than 40,000 people in 100 communities were participating in the programme.

By 1986, the project – now known as AMETRA 2001 – had spread to the 17 tribes of the Madre de Dios department, one of the most biologically diverse areas of the world.

AMETRA now organizes whole villages to collect *oje*, a milky tree resin that effectively treats intestinal parasites which sap the energy of everyone, especially children. AMETRA local promoters show the villagers how to prepare the resin for consumption by mixing it with honey and alcohol. On the date set by the general assembly of each village, everyone takes the *oje* at the same time, to minimize the risk of re-infection from untreated people. Clinical tests have shown that the resin reduces parasite infection by at least 70 per cent.

UNICEF and NGO Committee on UNICEF (1986). *Action for Children*, Vol. III, No. 4, New York.

Austria – are eliminated outright. A further 10 million hectares are seriously disrupted yearly (WCED, 1987).

Future generations will lose the benefit of vast amounts of genetic resources contained in the plants and animals of the rain forests. Estimates of the total number of species inhabiting the Earth vary between 4 and 30 million. To date, however, only 1.4 million species have actually been identified and been given a scientific name; far fewer have been seriously studied (Wilson, 1989). Most of the unidentified fauna and flora are thought to reside in tropical rain forests, which cover only 7 per cent of the earth's land surface. Yet they harbour perhaps half of all the world's species (UNEP, 1989). At the current rates of tropical forest loss, humankind may consign 1 million or more species of plants and animals to oblivion by the turn of the century (WCED, 1987).

By destroying them, we deny both our children and all future generations the opportunity to use nature's bounty to create new technologies, and produce new crops and medicines.

Deforestation is one major reason for the increase in floods over the past two decades. And deforestation in areas where rainfall is irregular, but very intense, causes severe soil erosion and renders the land less able to retain water and nutrients (UNEP, 1989b).

While rain forests tend to get the most attention, the loss of trees outside the forests – where there are usually higher human population densities – can more immediately

REPLANTING AFTER FIRE

Indonesia's Scouts – Gerakan Pramuka – are involved in innumerable environmental activities across the nation. In East Kalimantan, Scouts spend their weekends camping on Soeharto Hill, tending the saplings planted in 1987 after a fire levelled 100 hectares of hillside. Some 1,200 Scouts, who provided the funds for the seedlings and the costs of running their camps themselves, have been involved in every aspect of the work. It protects a catchment area whose water helps feed some 25,000 villagers in the foothills.

In Bener, Central Java, the Gerakan Pramuka built a reservoir and laid 12 kilometres of pipe to bring water for drinking and irrigating the rice fields of more than 11,000 people in four villages. Before the pipe was laid, the women of the villages had to walk nine kilometres to fetch water for their families. During the dry season, the villagers had relied on delivery of water by truck. Diarrhoea epidemics were frequent.

In both the reforestation and water-supply activities, the Gerakan Pramuka followed advice and guidance from government experts.

UNEP (1988). *Young Action for the Future*. UNEP, Nairobi.

damage mothers' and children's health. Some 300 million people in Africa rely on biomass for cooking, heating and lighting. Some 50 per cent of the population of India and 30 per cent of the people of China do likewise. Globally, three billion people may be consuming wood in a non-sustainable manner by the year 2000 (UNEP, 1989b).

Spending ever more time in search of fuelwood robs women of both time and energy; it has the same effects on children, who are often given this chore as a daily responsibility. As girls, rather than boys, usually gather fuel, this job may interfere with their schooling and make increased female education even more difficult to attain. Less wood may mean that less food is cooked, or cooked less thoroughly. There may not be fuel for boiling unsafe water.

Deserts and the future

Deforestation plays a part in desertification and general land degradation, along with other human activities such as over-cultivation, over-grazing and poor irrigation. All of these serve to make once productive land less productive or even unproductive – thus increasing malnutrition.

Desertification affects 4,500 million hectares of land, an area the size of North and South America combined. Every year an estimated 6 million hectares are irretrievably lost to the syndrome, and another 21 million hectares are so degraded that crop production becomes uneconomic. About 57 million people were affected by desertification in 1977, 135 million in 1984, and the numbers continue to grow. It causes annual losses in agricultural production of $26,000 million yearly, though only $4,500 million spent yearly would control it (UNEP, 1987).

On desertified land, crop yields fall, cattle decline, and children spend more time searching for wood and water. Desertification can thus reach into almost every aspect of children's health and nutritional status.

In several regions, demands for fresh water by growing populations are raising fears of serious water shortages. Groundwater levels have been steadily falling in many areas, particularly in Africa, China and India. This further undermines the poor's chances of managing their health, soils and environment in a sustainable way while robbing future generations of access to this vital resource (UNICEF, 1989b).

Given present trends, growing numbers of children will be living in absolute poverty as this millennium gives way to the next. Food and water supplies, and the health and homes of those increased numbers are threatened by atmospheric pollution and global climate change. The larger populations of the future may be forced to make their way in a rapidly changing world, surviving on a rapidly shrinking natural resource base.

Many millions of children born in the next few decades may face diseases previously alien to their areas and new to their immune systems, raised incidences of familiar diseases, or both. They may suffer with immune systems impaired by ultraviolet radiation. More children will be malnourished, as climate change disrupts farming systems. Health care, particularly primary health care in rural areas, is being cut back in many countries. These cuts are hardly prudent preparation for changed disease patterns.

However, the recent progress in cutting child mortality rates shows what can be accomplished, should political leaders and their constituencies decide that helping more children survive is a high priority.

Helping children survive must be a priority. For though it may sound paradoxical, raising children's survival is one of the surest ways to lower a nation's birth rate, thus ensuring its population does not outstrip the land's capacity to support it.

PROTECTING SOIL WITH FRUIT

Some 320,000 papaya trees were planted in the Thai capital, Bangkok, on World Environment Day, 1988. The work was done by 16,000 young farmers belonging to the Thai Yuwakasethorn Promotion Foundation.

The trees were planted near homes or on the grounds of local temples and schools, with seeds made available through local agricultural extension offices. Papaya was chosen for the mass planting because of its high nutritional value, its popularity with the local people and its suitability to the Thai climate – trees often fruit within a year of planting. But the farmers stressed that, like all trees, the papaya also protects the soil from erosion caused by tropical downpours.

The farmers collected papaya recipes from around the world: relish from Thailand, papaya baked with ginger and lime from the United Kingdom, papaya cheese soufflé from Haiti and curried papaya (or 'pawpaw') from Goa, India. They also noted that the papaya enzyme, papain, has long been used as a traditional meat tenderizer, and that the juice can even be made into a white table wine.

The mass planting was only one of many projects involving young people in environmental action organized by 28 youth organizations in Bangkok.

UNEP (1988). *Young Action for the Future*. UNEP, Nairobi.

Chapter III:

Achievements and challenges

Environmental resources and children are both key to the concept of sustainable human progress. This chapter looks at achievements and challenges in both areas, focusing first on children and then on the environment, with a central section on environmental education and awareness-raising.

One point must remain paramount – protecting the environment while providing development and health for children are not mutually exclusive goals. Rather, they are mutually inclusive – with almost anything done to aid children yielding benefits for the environment and vice versa.

1. Meeting children's basic needs

The three United Nations Development Decades, and most development planning in general, have focused on macro-economic indicators such as GNP, savings, investment, trade and production. This focus has tended to overlook children's and humankind's need for an environment which sustains human livelihoods and progress.

Thus at the beginning of the Fourth Development Decade, the planet is beset by widespread and accelerating environmental degradation, while hosting growing numbers of hungry, ill-housed and illiterate people. Population growth overwhelms many apparent improvements. For example, the percentage of malnourished people in the world is declining, but population growth means absolute numbers of the hungry are increasing (World Bank, 1986).

Therefore, growing numbers of development planners have concluded that fulfilling basic human needs – including the need for a sound environment – must become a central development goal. This will involve empowering people with knowledge to meet these needs, and empowering them to play an effective role in decision-making. Such a focus would judge the success or failure of any development initiative not only in terms of economic indicators, but with respect to raising basic quality of life. Reducing malnutrition, extending life expectancy, increasing health services, adequate shelter, sanitary living environments and educational opportunities, broadening the chances for religious, cultural and political expression – these would be the new criteria for success.

Unless most of these needs – nutrition, health care, shelter and education – are met for children, they cannot be met in the general population; it will be too late. In the developing world, much more obviously and immediately than in the industrialized nations, the meeting of basic needs depends upon a sound, healthy environment which contains

few pathogens and a minimum of pollution, and provides clean water, woodfuels, topsoil, building materials, etc.

In the past 10 years, remarkable progress has been made in improving children's health and survival chances. Science has provided many technical solutions for sustaining the environment and reversing degradation, though there is still tremendous debate about the cost-effectiveness of various options. Nevertheless, the barriers are now not so much technical, as economic, social and political. A first step in breaking through those barriers must be general agreement that children are one starting point of an international development strategy, as it is the children whose individual development and social contribution will shape the world's future. The other starting point must be the environment, as it is the platform and the source of resources for all future development.

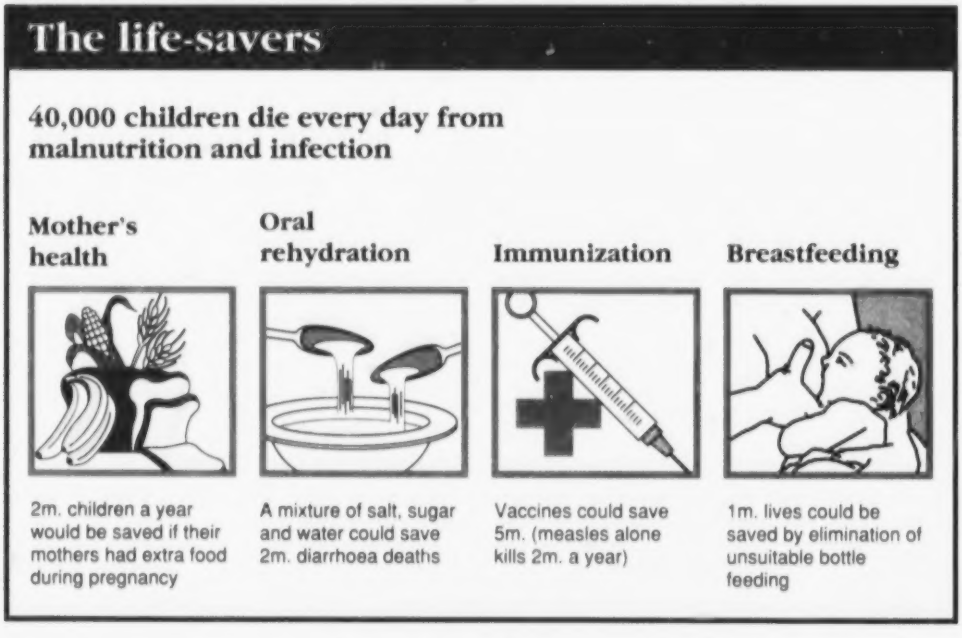
Immunization and health

Specific actions in the 1980s have saved the lives of several million children under age five, and by 1989 were reducing the annual child death toll by over two million (UNICEF, 1989d).

These lives have been saved by an approach known as the child survival and development strategy (CSD), which sought to accelerate mass use of low-cost but highly effective interventions. These include growth monitoring, oral rehydration therapy (ORT), breast-feeding and immunization, along with a renewed emphasis on food supplements, birth spacing and female literacy. This strategy has saved the lives of an estimated 7 million children, and protected the health and growth of an even larger number.

Polio incidence has been reduced considerably in the last decade, and it is hoped that the disease will soon be eradicated. WHO is committed to eradicate the disease all over

Figure 9:


The life-savers
40,000 children die every day from malnutrition and infection
Mother's health
Oral rehydration
Immunization
Breastfeeding
2m. children a year would be saved if their mothers had extra food during pregnancy
A mixture of salt, sugar and water could save 2m. diarrhoea deaths
Vaccines could save 5m. (measles alone kills 2m. a year)
1m. lives could be saved by elimination of unsuitable bottle feeding

Source: *Development & Co-operation*, No. 2, p. 27 (1985). German Foundation for International Development, Bonn.

the world by the year 2000. Although it has been virtually eliminated in most of the industrialized world, it still paralyses more than 250,000 children every year and kills some 23,000.

ORT is now saving the lives of nearly a million children each year (UNICEF, 1990). In this decade, approximately one quarter of the developing world's parents have been taught about ORT. The WHO/UNICEF guidelines on the production of oral rehydration salts are in use in 112 developing countries (WHO, 1986: Report to the 77th session of the WHO Executive Board).

In many industrialized countries, breast-feeding has made a spectacular comeback, although the trend towards its rapid decline has not yet been reversed in most developing countries (UNICEF, 1989a).

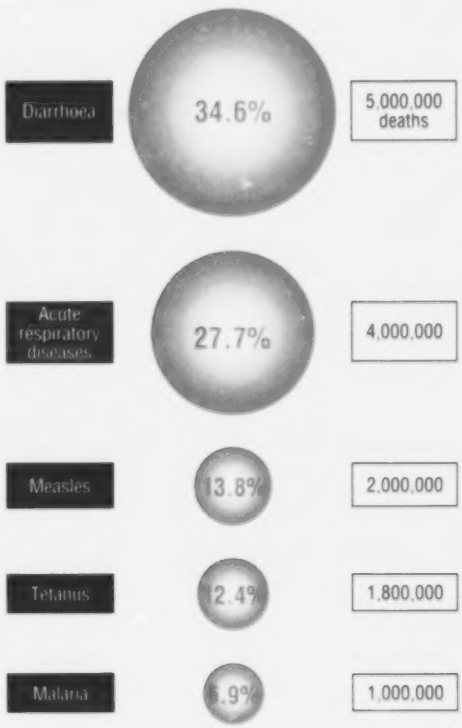
These and other successes in children's health have demonstrated the potential of combining technological breakthroughs, such as more heat-stable vaccines and ORT, with social mobilization. The mass media, religious groups, community organizations and the poor themselves are co-operating more and more towards the agreed goal of improving children's health. And these growing alliances are strengthening political resolve (UNICEF, 1989a).

It is now medically, technically and economically feasible to eradicate micronutrient deficiency diseases such as anaemia, xerophthalmia, goitre and cretinism, which kill or debilitate millions of children. Immunization coverage can be further extended, at relatively low cost. Better parent education can save the lives of most of the children who still die each year from dehydration, and improve the chances of a fully developed future for the even larger numbers who are being left malnourished by frequent diarrhoeal disease (UNICEF, 1989d).

Most industrialized countries are in the process of eliminating lead from petrol, thus removing one major threat to the health of children in the developed world. Treaties aimed at protecting the ozone layer and controlling shipments of hazardous waste should also have an effect on the health of present and future children.

Many countries in the industrialized world have not attained universal immunization. Many have not met goals for literacy rates, children born with low birth weight, prevalence of breast-feeding, perinatal care, early child development, and prevention of child abuse, which are now being proposed for developing countries (UNICEF, 1989a).

Figure 10:
The major child-killing diseases in developing countries (annual deaths)



Source: El-Hinnawi, E. (1990). Drawn from data given by UNICEF (1989) *The State of the World's Children*. Oxford University Press.

In terms of immunization and health care, UNICEF, WHO, UNESCO and other agencies have suggested the following goals for the year 2000, and thus for the Fourth Development Decade:

- Global eradication of polio.
- Elimination of neonatal tetanus by 1995.
- Elimination of guinea worm disease.
- Virtual elimination of vitamin A and iodine deficiency disorders.
- Reduction by 95 per cent of measles deaths and reduction by 90 per cent of measles cases by 1995, compared with pre-immunization levels.
- Reduction by 70 per cent of deaths due to diarrhoea in children under five years of age.
- Reduction by 25 per cent of deaths due to acute respiratory infections in children under age five.

Nutrition

For children in many countries, various combinations of economic recession, national debt, drought, soil degradation and deforestation have turned the 1980s into a decade of growing malnutrition.

The problem is not simply one of production. There have been revolutionary advances in food production over the past decade. High-yielding varieties of maize, wheat, rice, sorghum, millet, cassava and beans have produced food surpluses in every region of the developing world except Africa. Indonesia now exports rice; Pakistan exports wheat. India's 30-million-ton wheat reserve from local production enabled that nation to cope during 1986 and 1987 with its worst drought of the century (UNICEF, 1989d).

The problem is one of entitlement – of not having the income to buy food, the goods to exchange for it, or the means to grow it. Land reform, job-creation and raised income levels play as much of a role in improving nutrition as do high-yielding varieties of seed.

Moreover, lack of food at home is not usually the main cause of child malnutrition. While for millions of families an absolute shortage of money and food remains a problem, nutritionally debilitating illnesses among poor children are still a major factor in poor growth.

Parental ignorance is another major culprit. Too many know little about the importance of breast-feeding; a small child's need for more frequent food, enriched with a little oil or fat; and youngsters' needs for small daily amounts of green vegetables.

This last decade has seen some successes which permit guarded optimism that the goal of food for all by the year 2000 is achievable.

Many families in the developing world today can afford an adequate diet for their children. So ending the food problem means mobilizing all possible resources to inform and support parents in the use of today's best nutritional knowledge.

The technique of growth monitoring is an important tool. Regular monthly weight gain is the single most important indicator of a child's normal development. In Tamil Nadu, India, growth monitoring was used by village health workers as part of a large-scale World Bank-assisted project. The programme has reduced child malnutrition by 50 per cent in 9,000 villages, at a cost of approximately $10 per child per year. Similar results have been reported from Indonesia and elsewhere in recent years (UNICEF, 1989d).

Improved nutrition and health will depend on improving access to energy for cooking food and heating homes. About half the global population depends on fuelwood, crop residues and dung for energy. Thus the provision of energy becomes directly

dependent on environmental resource management.

There have been some small-scale successes in introducing social forestry programmes, village woodlots, and alternative cooking stoves which economize on fuel or run on biogas. These schemes help reduce the drudgery of women, and protect their health and that of their children. For example, smokeless stoves help reduce respiratory diseases and eye infections. Forestry programmes and village woodlots contribute, through reforestation and the reduction of deforestation, to agricultural productivity and environmental protection.

In Niger – where the sand-dunes claim more and more land each year, and average per hectare yields of millet continue to drop – tree planting and small-scale food production for household and village self-sufficiency have been set as top priorities by the Government (Lindstrom, 1988). The Niger experience shows encouraging results when food production is linked with tree planting for soil protection, nitrogen-fixing, sand-dune stabilization and production of firewood, fruits, building materials and livestock fodder.

If the energy needs of the developing world are to be met without causing further environmental degradation, programmes of reforestation, wood production and introduction of more fuel-efficient cooking stoves will have to be implemented on a far broader scale.

Given the progress and the many examples of what can be achieved, several United Nations agencies have proposed that severe malnutrition be virtually eliminated (reduced to less than 1 per cent) during the 1990s. Moderate malnutrition should be reduced by 50 per cent. Furthermore, growth promotion and its regular monitoring should be practised by all nations.

Water and sanitation

Some 535 million people gained access to clean water during the first eight years of the International Drinking Water Supply and Sanitation Decade of 1981-1990, and safe sanitation was provided for a further 325 million (WHO, 1988). This success was achieved through the employment of simple, low-cost techniques.

The goal of the Decade – safe water and adequate sanitation for all by 1990 – was not reached, but enough knowledge and experience were gained to reach this goal by the end of the present decade.

The slow progress towards achieving the Decade's goals has been attributed to several factors including population growth, the unfavourable world economic situation and the debt burden of developing countries. All of these have been obstacles to investment in infrastructure projects. WHO hopes that the goals of the Decade will be achieved by the year 2000.

The per capita cost of providing clean water was greatly reduced by the use of polyvinyl chloride pipes for gravity-fed water supply systems, lighter and cheaper drilling rigs and simpler and more reliable handpumps. In addition, training and maintenance requirements were simplified (UNICEF, 1989b). In the mid-1970s, the failure rate for handpumps in India was 70 per cent; today it is less than 10 per cent (UNICEF, 1989d). Improved techniques alone have reduced the per capita cost of clean water to perhaps one thirtieth of its 1970s' level.

Public participation is important in water and sanitation programmes. For example, women participate actively in the planning, construction, operation and maintenance of the Dodota water supply project in Ethiopia. In Kenya, women initiated a water-for-health programme in 1977, supported by UNICEF and non-governmental organizations. In areas where domestic water was made available, several improvements have been achieved in community life (UNEP, 1988).

Population

Rapid population growth is a factor in all forms of environmental degradation. It hinders all efforts to meet the basic needs of children.

Action taken now to let parents choose their families' size can have a dramatic impact on the size of the future global population. If the world achieves 'replacement level' fertility rates – i.e. slightly over two children per couple – by 2010, world population may stabilize at 7.7 billion by 2060. If, however, this replacement level fertility rate is not reached till 2065, global population would be 14.2 billion in 2100 (WCED, 1987). Such an explosion would obviously mean fewer resources per capita than are available today – a startling example of intergenerational irresponsibility and inequity.

The World Fertility Survey has found that women would have an average of 1.41 fewer children if they were able to choose their family's size. The difference amounts to approximately 1.3 billion more people in as little as 35 years' time (UNICEF, 1990). A growing realization that they can keep their children alive and healthy is one of the major motivating forces in women's desire for smaller families. It is therefore essential all childhood ailments – even those not directly linked to the environment – be reduced if we are to cut the drain on our planet's resources.

Apart from the fact that a family with fewer children has more money to spend on food for each child, birth spacing has a positive impact on the duration of breast-feeding and the degree of maternal attention. It also appears that infection and disease rates are lower among children whose births are more widely spaced (UNICEF, 1988).

Population growth, poverty and a productive environment form the three points of a triangle. Progress cannot be made in any one area unless progress is made in all areas. The most telling and tragic indicator of poverty is high infant mortality rates. According to UNICEF Executive Director James P. Grant:

> "No country has dramatically reduced its fertility rates until it has first significantly reduced its child death rates. Birth rates – and population growth rates – predictably fall once families are convinced that the children which they do have will survive" (Grant, 1990).

In India, experience has repeatedly demonstrated that attempts to lower the birth rate cannot be separated from efforts to meet the basic needs of the people who account for the high rate (UNICEF, 1988).

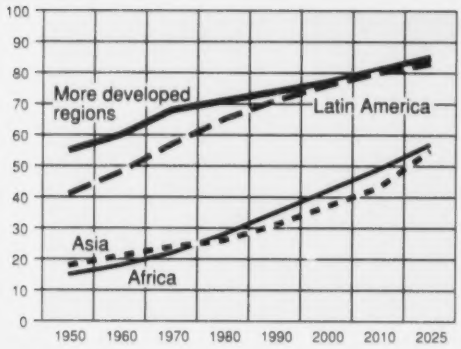
Successful programmes to improve birth spacing revolve around a range of health and literacy initiatives. Zimbabwe – which has the highest rate of modern contraceptive use in sub-Saharan Africa – has combined its child spacing campaign with free health care for the vast majority of the population, a vigorous programme of building hospitals and rural health centres, an expanded programme on immunization, a diarrhoeal disease control programme, a national nutrition programme and a national village health worker programme (Cornia, 1988).

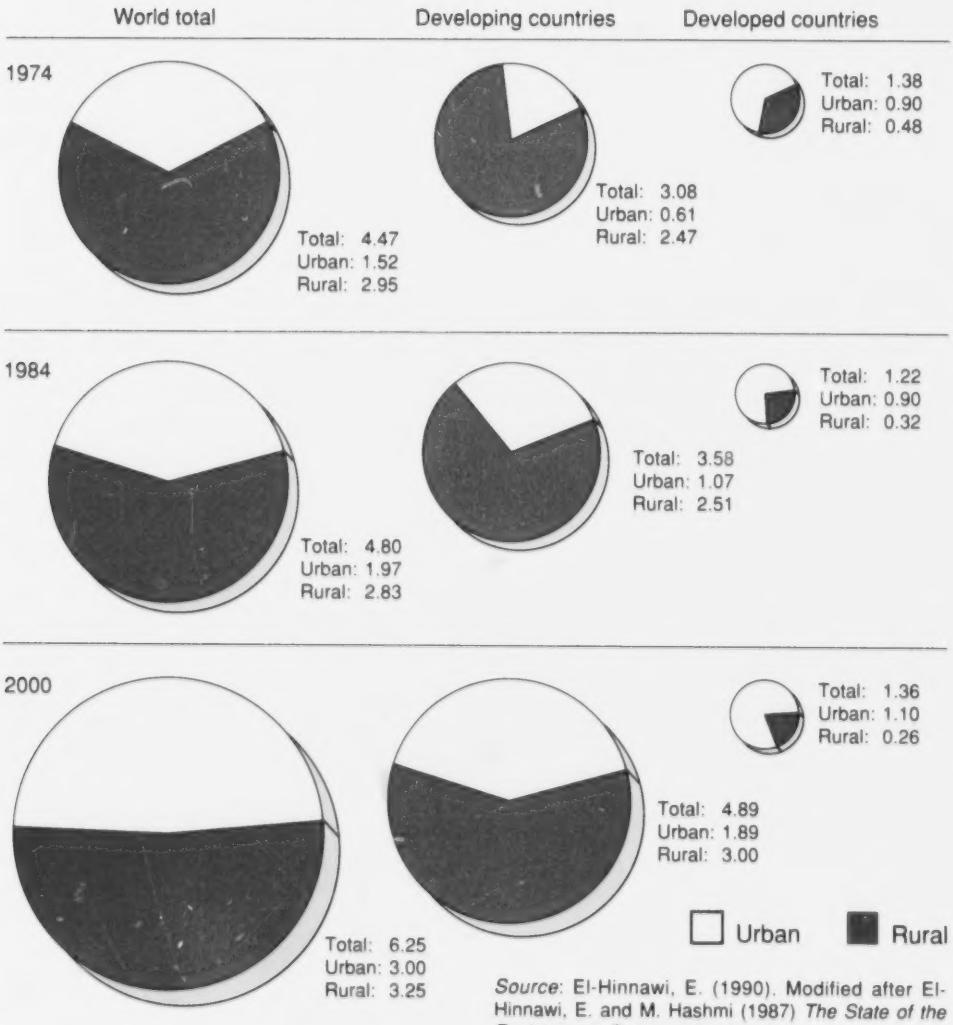
Ultimately, this combined health, nutrition and child spacing programme means fewer people living off diminishing environmental resources. The challenge is to implement a range of child survival and development strategies, particularly in Africa where fertility rates and infant mortality rates are still high. That way more children will survive and develop fully to adulthood, and more parents will decide to limit the size of their families.

Urbanization

Since 1950, the number of people living in cities has almost tripled. The world's urban population is expected to reach 2.234 billion

Figure 11:
Urbanization in the world... where to?





Source: El-Hinnawi, E. (1990). Modified after El-Hinnawi, E. and M. Hashmi (1987) *The State of the Environment*. Butterworths, London.

this year. In the industrialized world, urban populations rose by over 80 per cent from 477 million in 1950 to an estimated 877 million in 1990; in the developing world, urban populations much more than quadrupled over the same period, from 286 million in 1950 to 1.357 billion by 1990 (WRI, 1988).

In many developing countries, slum dwellers and squatters already make up 50 to 75 per cent of the urban population. By the year 2000, more than 2 billion people – 40 per cent of the developing world's population – will live in cities and towns in the developing world (UNICEF, 1989b). This rapid urbanization in developing countries has exacerbated the already dire problems in urban centres, and has strained the capacity of most governments to provide basic services. The deteriorating environmental conditions in such urban centres have had their most profound impact on children.

In many developing world cities, destitute people living in makeshift shelters or on the streets can expect to see one in four of their children die before the age of five of malnutrition-related diseases (WCED, 1987).

Nevertheless, many cities have begun successful programmes aimed at improving living conditions and employment opportunities for impoverished urban families, and for the millions of street children.

Many Latin American countries began innovative programmes for street children during the 1980s. In Brazil, where it has been estimated that 7 million youngsters live on the street, a variety of innovative schemes has been established in hundreds of communities. These programmes provide canteens and medical care for street vendors, organize street vendors under municipal protection, arrange the collection, sorting, repair and sale of discarded articles, and teach furniture-making and weaving, with discarded pieces of wood and local raw materials (ILO, 1988).

The Brazilian programmes have been made less bureaucratic, opening them up to broad public influence and participation. This has been done because community-run programmes have been observably more creative and competent in helping children (ILO, 1988).

In Ecuador, programmes also focus on non-bureaucratic interventions. It has been estimated that there are well over 2 million Ecuadorian children who lack social protection and assistance, and suffer the effects of low family incomes, poor health, poor nutrition and family disintegration. They are exposed to the threats of exploitation, destitution, delinquency, drugs and prostitution.

The National Institute for the Child and the Family (INNFA) has mobilized institutions, volunteers and communities at national, regional and local levels in Ecuador. New policies and methods included putting 'street promoters' on the streets to gain children's trust and friendship. These promoters identify children's needs and perceptions, and encourage their participation to define the programmes of most use to them.

The programme operates in two Ecuadorian cities, on a small scale. But encouraging results have been reported: 96 per cent of the children in the programme are working, mostly as shoeshiners and vendors (ILO, 1988).

In Peru, teenagers themselves have set up one of many organizations seeking to improve conditions and employment prospects for street children. With links to other international organizations, they aim to provide a forum so that children's voices may be heard. Most of the child members are urban street workers, who establish their own priorities and programmes, give financial aid to individuals and the movement as a whole, provide emergency funds, and survey their local areas on issues such as health, education, work, recreation, intrafamilial relations

and children's aspirations for the future (ILO, 1988).

In the past decade, many other countries have established their own programmes for children of the urban poor. Most successful projects depend on community involvement, with assistance from governmental agencies. Their success shows the urban poor have the resourcefulness to solve their own problems, given minimal external support.

Education

All of the above goals depend in large measure on increased and improved education in its widest sense.

In the 1980s, the percentage of people who can read has risen rapidly. The proportion of children in school has doubled, despite a doubling in the absolute numbers of children over the last 40 years (UNICEF, 1989d). But economic difficulties and rapid population growth have largely offset these gains, especially in Africa, Latin America and South Asia. The percentage of those who complete four years of education is very much lower in all regions, especially for girls. And it now appears that adjustments to recession

SCHOOLS FOR FOOD AND SURVIVAL

In the village of Lamorde, Niger, near the capital of Niamey, schoolchildren grow their own rice and millet in the rainy season and vegetables in the dry season. The Ful'be people of Lamorde are traditionally pastoralists, but their children are learning to become settled farmers because their parents lost so much stock in the mid-decade drought.

The programme, called by the Ministry of Education 'APP' (Practical and Productive Activities, in English), was launched throughout the nation in 1985.

The children of Lamorde do all the work themselves: clearing, planting, transplanting, weeding and harvesting. They plant 1.3 hectares in rice and can reap two harvests a year of five tonnes per hectare. UNICEF has donated a motorized pump to irrigate the rice field, and some fencing. Pupils are organized into a co-operative, with harvest receipts going to a common fund to contribute to costs. Gardening is organized by classroom, each class having its president, treasurer and secretary chosen by classmates. Both boys and girls are taught how to cook the grain in traditional ways and to prepare sauces from the vegetables.

Since the UNICEF-assisted programme began, 80 schools have started school gardens in Niger, with the number expected to double soon. There are another 1,025 school gardens around the country which obtain assistance from other sources.

In Lamorde, the parents have been inspired by the children's gardening activities, especially their sales of rice to the state Riz du Niger company. And the children are advising and helping their parents. To bring the work full circle, parents have set up a money-making co-operative which is able to help support the school.

UNICEF field report, unpublished (1987). UNICEF Abidjan.

are fuelling drop-out rates, sometimes to as high as 50 per cent, while slicing enrolment (UNICEF, 1989). By the turn of the century, an estimated 900 million people will be illiterate (WCED, 1987).

Progress towards literacy has been much slower for girls and women. Statistics compiled by UNESCO show that in 1980, more than 70 per cent of all African women were illiterate, compared to 50 per cent of both men and women, over age 15. In many rural areas, over 90 per cent of females are illiterate (UNICEF, 1985). This has serious implications for children's welfare; literate women usually have healthier, and fewer, children.

"If you educate a man, you educate an individual", Mahatma Gandhi said. "If you educate a woman, you educate the whole family." In recent years, many studies have shown that maternal education is one of the most powerful levers for raising family well-being (UNICEF, 1989d). The World Bank, in its review of such studies, concluded that "the evidence on the significance of the relationship is unequivocal. Maternal education is closely related to child health whether measured by nutritional status or infant and child mortality". Women manage much of the environmental resource base in the rural developing world as they farm, gather fuel

WRITING HISTORY AND CHANGING THE PRESENT

In 1986, 5,000 students all over the Federal Republic of Germany took part in a competition to write essays about German environmental history.

Their studies have led to action. Seventeen 10- and 11-year-olds in the small Bavarian village of Gunthersleben sought reasons why their local stream had been lined with concrete. Then they raised money to plant shrubs along the banks. In Hamburg, 12 young students studied the land around their school and found that it had once been drained to make allotments. But it turned sandy and barren. They sought and received a grant of several thousand Marks to re-green the area.

The contest became more controversial in the northern town of Verden when 16 students discovered arsenic in the remains of a wartime ammunition factory. Some adults tried to block further research, but the students completed a report which won the praise of the mayor, and are now lobbying for the decontamination of the whole area.

The contest, run by the Hamburg-based Korber Foundation, was so popular that it has been held annually throughout the rest of the 1980s.

"Their research helped young people to understand, first, to what extent the natural environment has been destroyed and, second, how so many environmentally unsound decisions came to be taken", said contest organizer Susanne Kutz. The students interviewed some of the people who took the decisions, and found how little was understood at the time about environmental degradation. After all, "environmental impact assessment, as we call it today, is a very new science", added Ms. Kutz.

UNEP (1988). *Young Action for the Future*. UNEP, Nairobi.

and secure water. So female education may also be closely related to environmental enhancement.

It now appears feasible that universal basic education can be provided by the year 2000 through a combination of formal schooling, non-formal education and other equivalency programmes. Investment in primary education has been shown to yield a high rate of economic return, improving health and productivity, while developing an enlightened citizenry (UNICEF, 1989a).

But providing facilities for schooling is only the beginning. The quality of education must be improved in several areas: curricula; the development of teaching materials; teacher training; relevance of schooling to local needs and conditions, including environmental conditions; flexibility of school systems; and creation of programmes that allow children to continue needed work. Urban schools should teach their children about pollution of the air and water, the use of trees to counter that pollution, and how to prevent and remain safe during floods.

Education and training should provide the basis for the proper management of local resources. "Rural schools must teach about local soils, water and the conservation of both; about deforestation, and how the community and the individual can reverse it" (WCED, 1987).

Such an approach, already under way in Niger, has had very positive results. Many schools there have small agro-forestry garden schemes, including dune-fixing by tree-planting, vegetable gardening by irrigation during the dry season, and the establishment of firewood tree plantations near villages. Those involved in the scheme say it succeeds because villagers themselves manage the projects (Lindstrom, 1988).

2. Environmental awareness and education

The home, the community and the school are the three basic spheres of environmental education. Efforts in all of these spheres must be linked to create appropriate perceptions of environmental problems, as well as solutions based on environmental awareness.

Environmental education starts in a child's home and immediate neighbourhood. A child's perception of the environment develops both at home and through formal schooling in nursery schools, temples, churches, and other pre-primary institutions. Mothers are important environmental educators, which is yet one more reason for ensuring that girls and women receive literacy training and environmental education.

Young children first learn to see and understand what is happening around them through contact with their mothers. As they grow, education at home plants ethics and seeds of future attitudes. Mothers can instil patterns of behaviour that lead to marked savings in food, water and energy consumption. Trained teachers can contribute much to increasing children's awareness of environmental issues at nurseries and kindergartens.

Mental alertness towards the natural environment seems to develop at the age of nine or ten. Children then can appreciate the interactions of people and nature. They present a challenge for teachers and curricula designers, activity planners and teaching educators. Teachers of these age-groups often need a choice of resource materials, help and counselling services.

In some countries, formal environmental education has been introduced as a primary school subject; in others it has been introduced as an added component of existing subjects: hygiene, nature study and population.

Sensitivity to the environment is not achieved solely through book learning, however, it requires real-life experiences also. There is an essential difference between 'learning' and 'awareness' – a student may learn and understand that a particular plant is rare and may know a great deal about its geography, taxonomy, etc. But he may still pull it out by the roots. True environmental appreciation means an awareness of nature's life-giving and aesthetic significance. A child that is made aware of trees' protective function – or of the inherent beauty of flowers in their natural setting – will not uproot them. This kind of sensitivity must come through both classroom lessons and frequent interaction with nature.

Effective environmental management will depend ultimately upon the widespread adoption of an environmental ethic – a code of conduct reflecting environmental awareness and the need for sustainable development.

Students enter secondary schools as children and leave as adolescents. Secondary school students are usually receptive and strongly motivated, and are capable of assimilating an environmental education that is (a) value oriented, (b) community oriented, and (c) concerned with human well-being.

HONEY AND FRUIT FROM AN OLD FORT

Scouts in Fiji are cleaning up a piece of coastal land that was once the site of a ring ditch fort for the defence of the nation's largest island, Viti Levu.

Six hundred Scouts have become custodians of the site. Using only hand tools, they cleared enough land for nearby villagers to establish gardens of cassava, yams, pineapples and vegetables to feed their families. The gardens cover about half the site, with a patch of cassava planted by the Scouts themselves to generate income for their organization and its work. They have also cleared a playing field for the local youths to use for football, volleyball and rugby.

The Scouts plan to turn the site into a conservation area for use by the public. They will plant fruit and ornamental trees and herbs, raise bees for honey, and build a complex that will house a police post, community hall, caretaker's residence, offices for the local council and a hall for Scout activities.

"The Scouts have been able to see for themselves the result of working together as a big family, and to learn the value of home gardening from the villagers who have planted vegetables and root crops", said Fijian Scouts' Deputy Chief Commissioner, Bhaire Lal. They have also created a pleasant area "for local people to visit and recapture some of their almost lost past. What more would one ask from a neglected piece of beach?"

UNEP *et al.* (1989). Asia-Pacific Youth and Environment pamphlet.

MAKING SURVIVAL A LAUGHING MATTER

Nepali comedians Madan Krishna Shrestha and Hari Bansha Acharya mix the broadest buffoonery with the most subtle satire. Hari Bansha is so proficient at imitating barnyard animals that pigs answer him back. Madan Krishna specializes in making fun of politicians. They do radio shows and produce cassette tapes, one of which sold 150,000 copies in a nation where 3,000 sales is the norm. They claim to be the only artists in Nepal who have earned enough to build a house solely from their earnings as performers.

Concerned about their people's health, the two turned their attention to the humorous, and not so humorous, sides of diarrhoea. They took their act to remote villages. But among the humour, they slipped in messages about the life-threatening effects of dehydration, benefits of oral rehydration therapy and descriptions of how to prepare ORS solutions. They worked puppets into the act to keep children's attention. Most children's deaths in Nepal stem from diarrhoea-related illnesses, but in 1986 it was estimated that only 20 per cent of the population knew how to mix a solution and administer oral rehydration therapy.

Madan Krishna and Hari Bansha promised to insert into their next tape a message about ORT, a simple intervention that could save the lives of 40,000 children each year in Nepal. Asked if they thought it would sell as well as their other tapes, Hari Bansha replied with a typical wisecrack: "Sure. We only record on the cheapest locally made tapes, so that many more people can buy it. The tapes break after being played twice, so people buy another one".

UNICEF and NGO Committee on UNICEF (1986). *Action for Children*, Vol. 1, No. 4, New York.

Considerable progress has been made in formulating guidelines and policies for environmental education. One of the major aims of the International Environmental Education Programme (IEEP) of UNESCO and UNEP is the incorporation of basic environmental considerations into primary and secondary education curricula. Such environmental considerations include a study of soil, plants and animals, water, air and their interaction with the human environment, as well as considerations of basic human needs, health, sustainable development, etc.

IEEP, which began in 1975, has urged the inclusion of these issues in national curricula. About 60 countries have introduced environmental education into their school plans. The recommendations of the International Congress on Environmental Education and Training in Moscow in 1987 have added to this momentum. UNEP and UNICEF will jointly sponsor a World Decade for Environmental Education from 1990 to 1999 (UNEP, 1988).

Classroom work is not enough, however. Young people must participate in tree planting, nature conservation, wildlife protection

THE UNEP YOUTH PROGRAMME

In 1985, International Youth Year, UNEP began to organize its youth programme by contacting youth organizations all over the world with an interest in environment. After receiving their comments and suggestions, UNEP launched its Youth Environmental Agenda, 'by young people and for young people', on World Environment Day the following year.

One of the main requests from the youth NGOs was for a network for the exchange of information on both problems and solutions. To provide focal points for such a network, UNEP asked its six regional directors to nominate two young people from each region to become 'youth environmental ambassadors'; these 12 had their first meeting in Nairobi in early 1988.

Since then, UNEP, expanding its work with global youth organizers such as Guides and Scouts, has become a centre of information about the work of the organizations of young people in attacking environmental problems.

UNEP Executive Director Mostafa Tolba told the environmental youth movement: "In these days of growing environmental awareness, young people are often among the first to understand the implications of the destruction of our natural resources, and to try to take preventive action".

UNEP (1988). *Young Action for the Future*. UNEP, Nairobi.

projects and other such activities outside of school. Groups in industrialized countries attempt to develop environmental knowledge and skills among youth. For example, the 4-H clubs and the Youth Conservation Corps in the United States; Boy Scouts, Girl Scouts and Guides, Rover Touring Clubs and Youth Camps in Australia, New Zealand and Europe; and the Blue and Green Patrols in the USSR have all contributed substantially in creating interest in environmental protection activities by youth.

The corresponding situation in developing countries ranges from fairly strong, coherent and ecologically conscious movements to very limited interest in environmental issues.

GETTING THE GARBAGE OUT

Two voluntary groups of young people and women have joined forces to clean up the Caribbean town of Vieux Fort on St. Lucia. They have succeeded where the Government did not.

It is not a low-tech operation. The two groups – Re-Organisation and Upliftment Towards Elevating the South (ROUTES) and the JEMS Progressive Community Organisation of St. Vincent and the Grenadines – have constructed three massive garbage chutes and ten litter bins. They have teamed up with the Government, which provides a truck to haul away the litter.

"Our success lies in individual motivation", said Andrew Simmons, a teacher and a UNEP youth environment ambassador who organized the operation, using pop music to attract members to the action groups. "What's important is the belief that people can help themselves – especially when they join forces – and we've tried to impress that upon our members through our education campaigns." Andrew Simmons set up the JEMS group in 1978 to teach environmentally sound community development. At the time, of the 52 youths in his small, mostly squatter community, he was the only one with a job.

UNEP (1988). *Young Action for the Future*. UNEP, Nairobi.

3. Creating a safe physical environment

Opinion polls, media coverage, statements by political leaders and the sheer number of international meetings on environmental topics all prove that environmental concerns have reached a new peak in public attention. Many of the concerns are the same as those during the first great wave of public attention in the late 1960s and early 1970s: water and air pollution, waste, loss of species, oil spills, pesticides, etc. Recent opinion polls show that the public tends to want more rather than less government regulation. These polls show an increasing awareness of the long-term aspects and broad scope of environmental issues (UNEP, 1988).

Many nations have established agencies and passed legislation to address these issues. Some have been effective, especially in areas which lend themselves to domestic, legislated solutions.

Environmental control measures introduced in the 1970s have yielded a general decline in or at least stabilization of carbon monoxide, nitrogen oxides, sulphur dioxide and suspended particulate matter emissions in most urban areas of many industrialized countries. Yet, some cities of these nations still have ambient air pollutants above the upper exposure limits established by WHO (UNEP, 1987, 1989). Expanded and improved

air pollution monitoring must be practised in cities around the world. Developing countries need more training, transfer of technology and improved methods.

In general, the overall quality of the water in rivers and streams of the industrialized countries has improved since the 1970s. However, the concentration of nitrates has increased in almost all surface-water bodies. Scattered data indicate that water and air pollution, domestic wastes and soil degradation are growing problems in many developing countries. Recent information from Eastern European countries reveals environmental problems there which also require urgent consideration.

Today, most attention is focused on the international challenges that require international solutions: climate change, ozone depletion and acid rain. Issues which were once viewed as largely domestic – problems such as tropical deforestation and desertification – are now viewed as challenges for all nations, given their effect upon the international climate and the loss of the planet's biodiversity. The disposal of waste has become an international concern as toxic and hazardous wastes moved across borders in larger amounts throughout the 1980s.

All of these international issues are intergenerational, in that their effects are either difficult or impossible to reverse over the period of one generation. All focus attention on the welfare of children alive today – and of children yet to be born.

Coping with all of these issues will require levels of international co-operation not previously evident on the planet. There have of late been several encouraging examples of such global teamwork and unity of concern.

The signing of the Convention on Long-range Transboundary Air Pollution in 1979 demonstrated countries' determination to work together to cut back sulphur and nitrogen oxide emissions to acceptable levels. The Protocol to the Convention requires participating nations to reduce either national sulphur emissions or their transboundary flows by 30 per cent from 1980 levels, by 1993. It entered into force in 1987.

Concern over marine pollution, especially in regional seas, has continued. Action plans to reverse the deterioration of regional seas had been adopted in nine regions by the end of 1986, with the assistance of UNEP. Regional conventions have been signed in eight of the regions, providing a legal framework within which appropriate measures for the protection of these seas and their resources can be enforced among the parties.

The dumping of low-level radioactive waste in the Atlantic Ocean has been halted since 1983, and also been prohibited in the South Pacific Ocean under a convention signed in November 1986. In 1987, eight North Sea countries agreed to reduce waste incineration on that sea by at least 65 per cent by the end of 1990 and to phase it out altogether by 1994, as well as halting the dumping of chemical waste after 1989.

The 1982 United Nations Convention on the Law of the Sea, although as yet unsigned by several key nations, represented a major step towards an integrated management régime for one of the global commons. It has already encouraged national and international action to manage the oceans.

The Tropical Forestry Action Plan, initiated in 1985 by parts of the United Nations system and by NGOs, co-ordinates the meeting of human needs, environmental management and sustainable forest development. It is slowly gaining recognition by concerned countries. Its work must now be more fully integrated with that of the International Tropical Timber Organization (ITTO), which was established in 1986 to represent the interests of both the major tropical timber producers and consumers. ITTO tries to establish the

management of tropical forests and timber trade, on a sustainable basis.

Recent concern over the decline of biological diversity has prompted action by the International Union for Conservation of Nature and Natural Resources (IUCN) and UNEP. There is a pressing need for a comprehensive biodiversity strategy. This would include a global convention to provide a strong legal basis for international co-operation. Both IUCN and UNEP are working to achieve this goal.

Several accidents that involved spills and leaks of hazardous material have triggered widespread concern over the dumping of hazardous wastes. Extensive efforts are under way in OECD countries to rehabilitate thousands of landfills and surface impoundments that have proved inadequate for the dumping of such wastes. In 1988, the OECD established a core list of hazardous and other wastes that should be controlled in transfrontier movements. In 1989, a global convention to control the transboundary movement of hazardous wastes was adopted in Basel, Switzerland, at a diplomatic conference convened by UNEP after two years of intense negotiations.

Efforts to address the possible threats of ozone depletion led to the adoption of the Vienna Convention for the Protection of the Ozone Layer in 1985. It was followed, in September 1987, by the Montreal Protocol on Substances that Deplete the Ozone Layer – a landmark in international co-operation to protect the environment. Many nations and organizations are working to strengthen the pact.

A global strategy to cope with climate change has proved more illusive, given the wide spectrum of causes and the uncertainty over the timing and severity of effects. This is an issue – along with the related issues of ozone depletion and the loss of biodiversity – which will have far-reaching effects on the well-being of future generations.

UNEP has been encouraging general agreement on an international convention on the atmosphere, to be ready for signing by 1992. An Intergovernmental Panel on Climate Change (IPCC), working under the auspices of WMO and UNEP, expects to offer its final report in September 1990. This report will be the scientific foundation on which the strategy to deal with global climate change is to be built.

These developments have paralleled major changes in the ways the United Nations system approaches environment and development. Resolutions passed by the United Nations General Assembly in 1987 following the presentation of the UNEP report, *Environmental Perspective to the Year 2000 and Beyond* and the WCED report, *Our Common Future*, make the ideal of environmentally sound and sustainable development a common goal of the entire United Nations system. Many United Nations organizations have already conducted policy reviews to find paths towards this goal.

The United Nations is also moving to implement its System-Wide Medium-Term Environment Programme (SWMTEP), meant to co-ordinate activities on environmentally sound and sustainable development throughout the entire organization. 'SWMTEP-II', published in 1988, covers the years 1990-1995. In the area of atmosphere, to give one example, it co-ordinates the work of bodies such as IAEA, UNEP, UNESCO, WHO, WMO and many others.

As 'SWMTEP-II' states, the exercise attempts to "present coherently what the United Nations system should do in a co-ordinated manner in the field of the environment. But it will be implemented effectively only if governments collectively support the environment programme by making appropriate decisions in the governing bodies of the United Nations system, activating and expanding global and regional monitoring and information networks and providing the funds

for agreed programmes of technical assistance and collaborative action" (UNEP, 1988).

The publication of the two reports in 1987 and the United Nations resolutions that accompanied them have set in motion a series of events which will provide momentum for the search for environmentally sound and sustainable development for the coming years and beyond.

Regional efforts are also under way. Africa held its regional meeting on environment and development in June 1989, in Kampala. Meetings were scheduled for the other regions of the world in 1990, leading to a global conference in Brazil in 1992.

This meeting will doubtless have a broad agenda. But it is timely and appropriate that UNEP and UNICEF have now joined forces to place children and future generations firmly upon this and all other environment/development agendas. Just as recent international agreements on the environment may be regarded as encouraging signs of humanity's improving ability to manage the global environment, the 1989 Convention on the Rights of the Child may be regarded as an encouraging sign of humanity's ability to provide for the needs of children and future generations.

Further progress will require new international laws, new economic tools, new definitions of security, more effective public participation in decision-making, much more information more widely dispersed, and new levels of international co-operation.

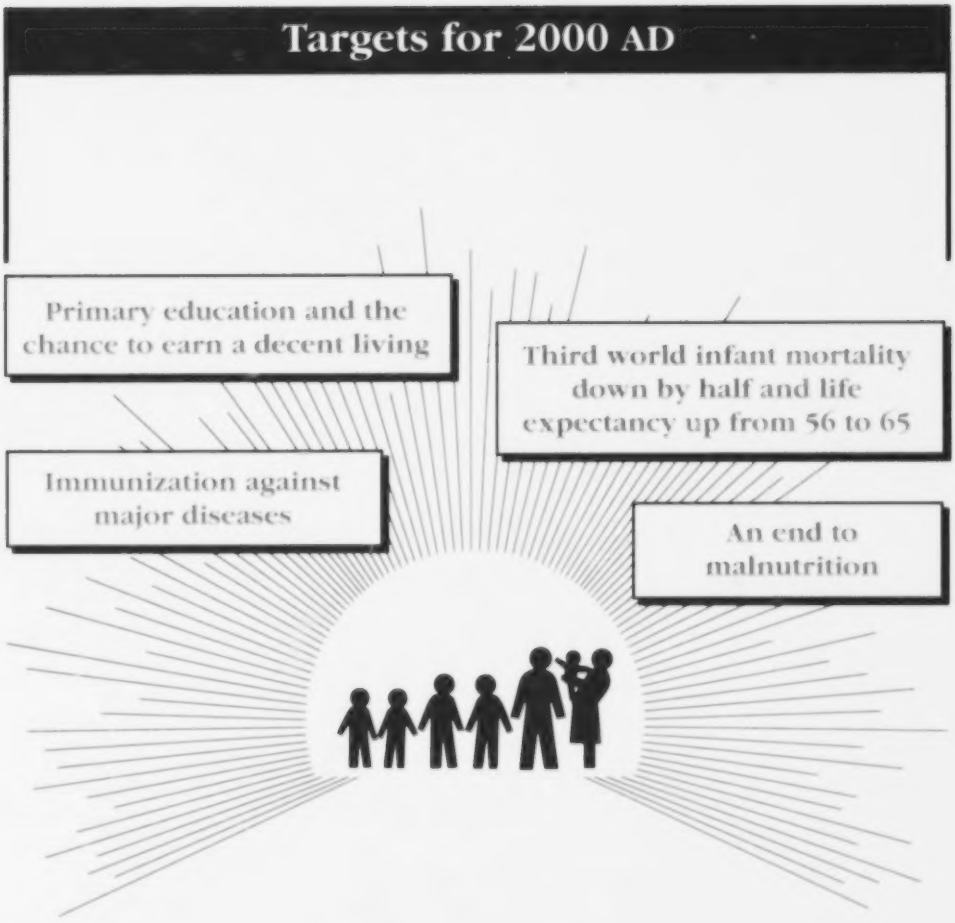
The achievement of environmentally sound and sustainable development will require far more than action on the part of United Nations agencies and governments. Co-operation among them is crucial. Justice for children and all future generations can be gained only through a grand alliance of awareness, mobilization and action stretching from individuals and neighbourhoods to governments and world leaders. That alliance must be based on the realization that almost every act has environmental consequences, and has consequences for children and future generations.

Only the adult generation can address the many threats to Earth's future. Decisions and key processes must be set in motion soon in the 1990s before it it too late. Both children – those alive and those yet to be born – and the environment must be given primary consideration in this process. All people, including children, must play a role. There are many examples in this report of local initiatives driven by global vision. Only a global vision can save the Earth, and preserve our role as its caretakers.

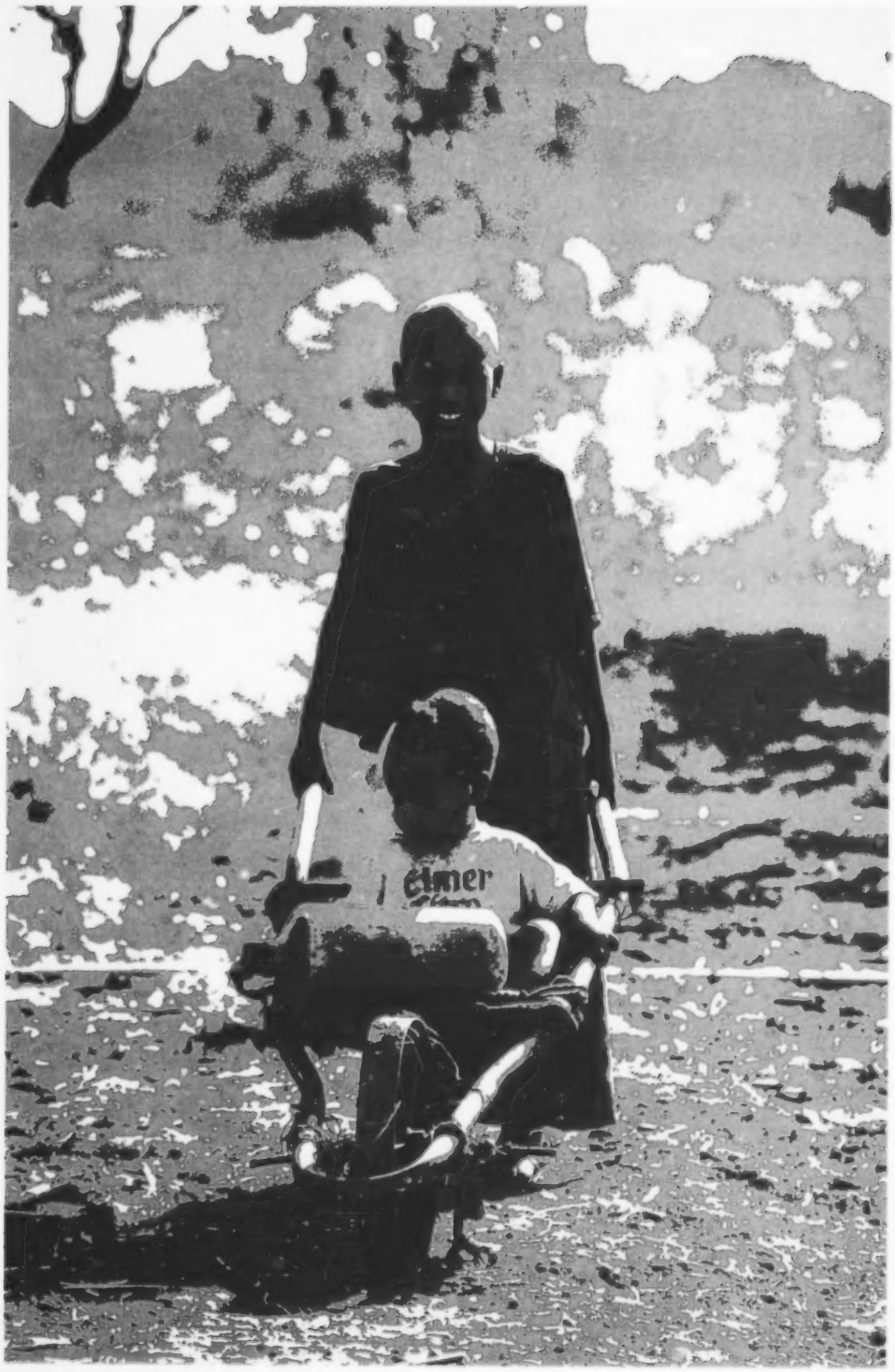
The technology is largely in place. Many societies are rapidly becoming more open, and many more people are taking part in the decision-making process. This offers a social opportunity, as environmentally sound and sustainable development cannot be achieved without public participation in decision-making and broad freedom of information.

Improved health, welfare and education of children can provide a sign that humankind is capable of sustainable human progress in a sustaining environment. The state of our children, and the state of our environment, say more than anything else about the state of our civilization and the prospects of our future as a species.

Figure 12:


Targets for 2000 AD
Primary education and the chance to earn a decent living
Third world infant mortality down by half and life expectancy up from 56 to 65
Immunization against major diseases
An end to malnutrition

Source: El-Hinnawi, E. (1990) personal communication.


Elmer

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CHILDREN AND THE ENVIRONMENT — ERRATA

Text changes:

Page 4. Left column, line 23 should read "...law *and* economics".

Page 22. Right column, following line 9 add: A recent study revealed that the incidence of leukaemia was higher in children born near Sellafield nuclear plant in the United Kingdom and in children of fathers employed at the plant, particularly those with high radiation dose recordings before their child's conception (Gardner, M.J. et al., 1990).

Page 30. Right column, line 9, for "thousands" read "hundreds".

Clarification of references:

Page 11. Left column, line 6, add after "Guide" the reference (Elkington and Hailes, 1988).

Right column, line 24 should read (World Bank, 1989a).

Page 13. Left column, line 1 should read (Cornia et al., 1988).

Right column, line 2 should read (World Bank, 1989b).

Page 14. Left column, line 30 should read (El-Hinnawi, 1986).

Page 15. Delete source.

Page 17. Right column, last line should read (WHO, 1987a).

Page 18. Left column, line 1 should read (UNICEF, 1989d).

line 7 should read (WHO, 1987a).

Page 23. Left column, line 17 should read (WHO, 1987a).

Page 24. Left column, lines 4 and l0 should read (WHO, 1987a).

Page 26. Left column, line 5 should read (UNICEF, 1989d).

Right column, in lines 9, l5 and 44 reference should read (WHO, 1987a).

Page 27. Left column, line 2, delete (WHO, 1985).

Page 28. Left column, line 12, delete (Colley and Brasser, 1980 and Groupe Coopératif PAARC, 1982).

Right column, line 5 should read (UNEP,1989a).

line 23 should read (WHO, 1977b).

Page 29. Left column, line 38 should read (WHO, 1977b).

Page 29. Right column, in line 19 insert reference (Needleman, H.L. et al., 1990).

Page 32. Left column, in line 7 reference should read (Mott, 1984).

Page 34. Left column, line 12 should read (UNICEF, 1989d).

Page 35. Left column, line 8 should read (WHO, 1987a).

Right column, line 26, insert reference (El-Hinnawi, 1985).

Page 40. Right column, lines 24 and 41 should read (UNEP, 1989a, 1989c).

Page 42. Right column, line 13 should read (UNEP, 1989a; UNICEF, 1989b).

Page 43. Left column, line 17 should read (UNEP, 1989a).

Page 52. Right column, line 29 should read (Cornia et al., 1988).

Page 59. Right column, line 10 should read (UNEP and UNESCO).

Page 61. Right column, last line should read (UNEP, 1989a).

Page 64. Left column, line 2 should read (UNEP, 1988b).

Page 67. The authors in the first reference should read: Anderson, D.M. et al.

Line 11, delete reference beginning Bugliarello, G. et al.

Line 13, add (1989) after Centre for Our Common Future.

Page 68. Add: El-Hinnawi, E. (1986). *Disarmament, Environment and Sustainable Development*. UNEP, Nairobi.

Add: Elkington, J. and J. Hailes (1988). *The Green Consumer Guide*. Victor Gollancz Ltd., London.

Add: Gardner, M.J. et al. (1990). 'Results of case control study of leukaemia and lymphoma among young people near Sellafield nuclear plant in West Cumbria'. *British Med. J.*, 300, 423.

Add: Grant, J. P. (1990). 'Basic Education for All: getting at a root of many problems'. Address to the Global Forum on Environment and Development for Survival, Moscow, January 1990. UNICEF, New York.

Line 12, for "Flynn et al." read "Flynn, H. et al.".

Page 69. Line 9, delete reference beginning ICF/Clement.

Page 70. Add: Needleman, H.L. et al (1990). 'The long-term effects of exposure to low doses of lead in childhood'. *New England J. Med.*, 322, 83.

Page 71. Line 3, delete Science (1989), 243, 1280.

Line 4, delete reference beginning Shane, B.S. (1989)

Add: UNEP (1988a). *The State of the Environment — The Public and the Environment*. UNEP, Nairobi.

Line 23, for UNEP (1988) read UNEP (1988b).

Line 25, for UNEP (1989) read UNEP (1989a).

Page 72. Line 23, for World Bank (1989) read World Bank (1989b).

Add: World Bank (1989a). *World Development Report*. Oxford University Press, Oxford.

Last reference: World Health Organization (1970) should read (1977a).

Page 73. First reference: World Health Organization (1977) should read (1977b).

Line 7, delete reference beginning World Health Organization (1986).

Line 8, World Health Organization (1987) should read (1987a).

COURTESY OF UNITED NATIONS ENVIRONMENT PROGRAMME

AND UNITED NATIONS CHILDREN'S FUND